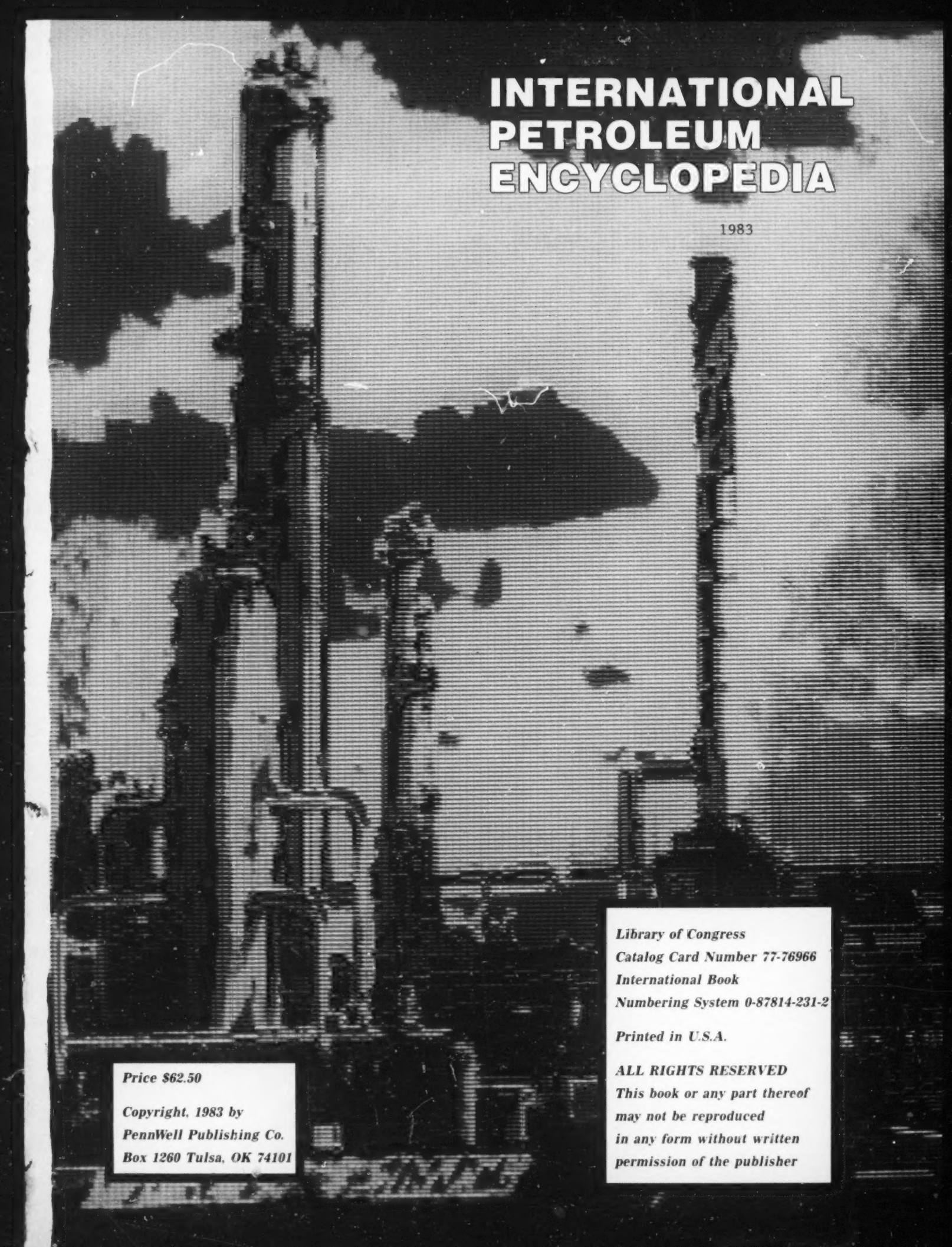

INTERNATIONAL PETROLEUM ENCYCLOPEDIA

1983

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INTERNATIONAL PETROLEUM ENCYCLOPEDIA

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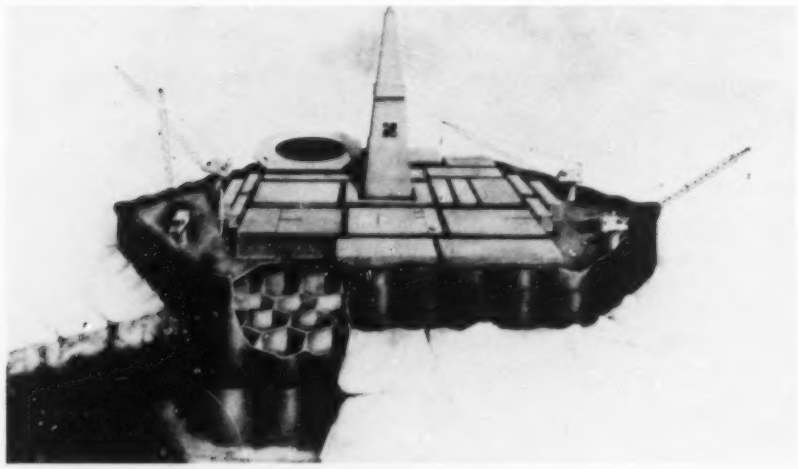


Artist's conception of mobile Arctic caisson.

ZAPATA OFFSHORE CO. AND BRIAN WATT ASSOCIATES INC., BOTH of Houston, unveiled plans late in 1982 to develop a mobile caisson drilling system designed to operate year round in shallow waters off the coast of northern Alaska.

Designated Bwacs (for Brian Watt Arctic caisson system), the unit will have a hexagonal, honeycomb base of reinforced concrete capable of withstanding first year ice. Large storage capacity will allow 10 months of operation without resupply.

The rig will be designed to drill in 30-60 ft of water with a minimum of site preparation, being submerged to the seabed with water ballast.

Zapata said the unit will be suitable for areas where water depths or earth materials make construction of gravel islands uneconomical, including the Diapir area and other regions off Alaska.

Zapata acquired the marketing rights and planned to develop drilling systems for the structure. Brian Watt had patents pending for the design.

tion, high reservoir pressure, and proximity to water and miscible injectant.

ARCO planned to inject water alternating with gas in an inverted nine spot pattern on 80 acre spacing for at least 10 years or until the miscible gas slug pore volume reached 10%.

The company estimated that about 122 million bbl of oil, or 27.7% of original oil in place, will be recovered by primary means.

An 80 acre pattern waterflood and infill drilling will add another 65 million bbl, or 14.7% of original oil in place, to ultimate recovery. And the EOR project will further boost recovery by 24 million bbl of oil, or 5.4% of original oil in place.

In addition, reservior simulation studies suggested that increasing the pore volume of the miscible gas slug injected to 15% from 10% will boost tertiary incremental recovery to 8.3% of original oil in place.

Geological setting. Oil in Prudhoe Bay field is trapped in the Sadlerochit formation, a sandstone and gravel zone at about 9,000 ft. The structure is a broad, gently dipping, truncated anticline.

Named for the Sadlerochit Mountains, where it outcrops southeast of Prudhoe Bay, the sand and gravel formation was deposited by a braided river during the Permian-Triassic period.

Table 1

Beaufort Sea shelf resources

	95% probability	5% probability	Statistical mean
Oil (billion bbl)	1.9	16.7	7.0
Gas (trillion cu ft)			
Associated/dissolved	3.0	26.8	11.1
Nonassociated	6.4	58.5	23.9

Source: U.S. Geological Survey

The reservoir slopes gently upward toward the northeast. Oil is trapped by overlying Cretaceous shale. The reservoir contains more than 400 ft of natural gas sand—the gas cap. Below the gas cap is the oil sand, averaging 440 ft thick.

Kuparuk field produces from the Lower Cretaceous Kuparuk River formation, a fine grained marine sand. Porosity is about 23%, permeability 125 md, average pay thickness 40-50 ft.

Unlike Prudhoe Bay, Kuparuk has no gas cap. It is a low pressure reservoir, requiring artificial lift.

Overlying the Kuparuk pay is a heavy oil zone in the Cretaceous Ugnu. It contains a number of shallow sands covering an area of more than 200 sq miles at depths of 2,000-4,000 ft. One of the sands, still undefined as of late 1982, may cover an area of as much as 600 sq miles. That probably would cover offshore acreage as well as land areas.

ARCO said in March 1982 the Ugnu heavy oil deposit could represent a resource base of 18-40 billion bbl of oil. But tapping the resource will depend more on Alaska's tax policies than on technical feasibility, the company said.

One problem with determining commerciality of the heavy oil is uncertainty over its gravity. ARCO measured Ugnu oil gravities ranging from 11° to 22° in fluid samples from drillstem tests. But it also turned up 26° gravity oil, comparable to Kuparuk oil, in Ugnu cores.

Another problem is the harsh Alaskan environment. North Slope permafrost occurs as deep as 1,500-2,000 ft, and the Ugnu reservoir temperature was thought to be 60-80° F. That could render steam injection from the surface uneconomic. But it could open the door for downhole steam generation.

In addition, waterflooding could be ineffective if Ugnu oil gravity proves to be consistently low.

ARCO was studying both recovery methods for tapping Ugnu heavy oil as well as in situ combustion and gas injection.

Ugnu oil recovery could require development of new production technology, the company said. But the oil seems to be amenable to conventional refining.

Prudhoe Bay and Kuparuk fields lie in an area of northern Alaska where bedded rocks are divided into three sequences, reflecting major phases of tectonic development—Brookian, Ellesmerian, and Franklinian (Fig. 4).

A study by the USGS shows that the pre-Mississippian Franklinian sequence consists of a variety of deformed and mildly metamorphosed clastic and carbonate geosynclinal rocks. Orogenic uplift during the late Devonian shed large amounts of clastic debris southward. Erosion and subsidence of the Devonian orogen provided a platform for deposits on the Ellesmerian se-

PANARCTIC Oils Ltd. Cisco B-66 could be the Canadian petroleum industry's first commercial oil discovery in the Arctic Islands. Drilled from an ice platform at a site overlying 961 ft of water 10 miles west of Lougheed Island, the well resulted in a dual zone oil and gas discovery with a major oil discovery indicated in the Awingak formation during 1981.

Table 2

Prudhoe Bay Unit operating agreement participants

Oil rim	Percent*
Sohio Alaska Petroleum Co.	52.96
ARCO Alaska Inc.	20.38
Exxon Corp.	20.38
Mobil Oil Corp.	2.08
Phillips Petroleum Co.	2.03
Chevron U.S.A. Inc.	0.84
Getty Oil Co.	0.55
Amerada Hess Corp.	0.54
Marathon Oil Co.	0.05
Louisiana Land & Exploration Co.	0.04
Placid Oil Co.	0.04
N.B. Hunt	0.03
Hunt Industries Inc.	0.02
Caroline Hunt Trust Estate	0.02
Wm. H. Hunt Trust Estate	0.02
Lamar Hunt Trust Estate	0.02
Total	100.00
Gas cap	
ARCO Alaska Inc.	42.24
Exxon Corp.	42.24
Sohio Alaska Petroleum Co.	14.59
Chevron U.S.A. Inc.	0.40
Mobil Oil Corp.	0.27
Phillips Petroleum Co.	0.26
Total	100.00

*Rounded to nearest 100th of percent.

to that of oil on a BTU basis, no existing or currently planned transportation facilities would be available, and gas would be transported to the Lower 48 as LNG.

With a 10% rate of return criterion for development, the risked mean assessment of 68 trillion cu ft of nonassociated gas drops to 10 trillion cu ft of economically recoverable resource.

Onshore North Slope. Because it is onshore and because drilling has taken place in northern Alaska for more than 20 years, operating challenges are fewer in onshore North Slope areas than in offshore regions.

NPC pointed out that drilling can be conducted with conventional land rigs modified to handle the extremely cold weather on the North Slope.

NPC estimated that wells drilled to 12,000 ft would cost $28 million in the Alaska National Wildlife Refuge, where drilling is prohibited, and $25 million outside the refuge.

In the wildlife refuge, that involves $17 million for fixed costs, rig day rates of $20,000/day, and logistical support costs of $80,000/day. Drilling time would be 110 days and drilling cost alone $11 million.

Cost factors would be the same outside the wildlife refuge, except the report assumed drilling time of 100 days and drilling cost of $10 million.

NPC said, "Operations under way in Prudhoe Bay field have clearly demonstrated that operations can be carried out on a large scale without significant deleterious effects on the environment or native population."

Northern offshore area. The NPC report emphasized that ice is a critical problem in the Chukchi and Beaufort Seas off Alaska.

In the Chukchi Sea south of about 70° N. Lat., water generally is less than 150 ft deep, but periods of open sea—with ice coverage of about 50%—last only 4-5 months/year.

North of 70° N. Lat., the ice free season lasts only 1-2 months/year. Water depths in the Chukchi basin are less than 300 ft. In the Beaufort basin, water depths reach 700 ft.

In the southern Chukchi Sea, exploratory drilling could be conducted from gravel islands in water less than 60 ft deep or from jack ups with seasonal drilling capability in water depths of 25-200 ft.

Bottom founded structures such as gravity cone platforms probably would be used for year round operations in water 60-200 ft deep.

Man made islands in water depths of less than 100 ft and gravity cone structures in deeper water probably would be necessary in the northern Chukchi and Beaufort Seas.

Permafrost can be encountered in these areas, so wells probably would be completed with casing programs, cementing techniques, and tubing strings similar to those used on the North Slope.

The NPC report projected Chukchi Sea wildcat costs at $90 million/well. That included no major fixed costs, rig day rates of $300,000/day, and logistical support costs of $200,000/day.

Chuchi Sea drilling time would amount to 180 days/well.

Costs for Beaufort Sea wildcats were estimated at about $40 million/well, assuming that drilling is conducted from artificial islands that cost $50 million each or $20 million/well. Rig day rates were pegged at $20,000/day, logistical support costs at $180,000/day.

Drilling time for a Beaufort Sea well drilled from islands is 100 days/well at a drilling cost of $20 million/well.

Alyeska system. Capacity of Alyeska's trans-Alaskan crude oil pipeline won't be a constraint to sizable increases in Alaska North Slope oil production, spokesman for the system said in 1982.

Feasible capacity expansions could enable the 800 mile, 48 in. line to transport as much as 2.5-2.7 million b/d—about 1 million b/d more than its throughput at that time.

Use of drag reduction agents (DRAs) boosted the system's capacity to August 1982 throughput of 1.653 million b/d from 1.427 million b/d. That could easily accommodate North Slope production of about 1.5 million b/d plus condensate from Prudhoe Bay field and about 90,000 b/d from Kuparuk field.

Prudhoe Bay field is limited by state law to an average 1.5 million b/d. Kuparuk is scheduled to yield about

Table 3

How Alaskan oil economics shape up

Area	Undiscovered resources: Adequacy chance*	Undiscovered resources: Risked mean	Economic Undiscovered resources: 10% rate of return: Minimum economic reserve	10% rate of return: Chance for min. econ. reserve	10% rate of return: Economic resource base†	15% rate of return: Minimum economic reserve	15% rate of return: Chance for min. econ. reserve	15% rate of return: Economic resource base†
	Percent	— Billion bbl —		Percent	— Billion bbl —		Percent	Billion bbl
Beaufort Shelf	88	8.2	0.4	88	8.2	1.1	88	8.2
Alaskan National Wildlife Refuge	70	2.3	0.5	69	2.3	1.6	44	2.1
Other North Slope	79	2.1	0.6	75	2.1	1.6	48	1.8
NPRA	79	2.1	0.6	78	2.1	2.3	46	1.6
Central Chukchi Shelf	62	1.7	1.5	43	1.6	4.5	8	0.5
Navarin basin shelf	41	2.3	0.9	36	2.3	2.9	22	2.0
St. George basin	47	1.2	0.6	39	1.1	1.4	27	1.0
Bristol basin	47	0.6	0.6	44	0.6	1.2	34	0.6
Norton basin	43	0.3	0.5	23	0.3	2.5	1	0.0
Beaufort Slope	57	1.3	§	—	0.0	§	—	0.0
North Chukchi Shelf	50	1.2	§	—	0.0	§	—	0.0
North Chukchi Slope	34	0.3	§	—	0.0	§	—	0.0
Other areas	—	0.5	—	—	0.0	—	—	0.0
Total		**24.1**			**20.6**			**17.8**

*Chance of finding more than 0.05 billion bbl of oil equivalent. †Risked mean economic resource. §Not technologically feasible.
Source: National Petroleum Council

There was little action on the Mackenzie Delta, however. That action was deferred until it was clear when the region's reserves could be tapped by a pipeline to markets in the South.

Oil & Gas Journal reported that the Canadian petroleum industry spent about $1.2 billion during 1982 on frontier exploration/delineation progarms, a slight increase in real terms from 1981 spending of $1.067 billion.

Subject to resolution of political problems, the pace of spending could accelerate in 1983 as a number of new players joined the frontier stakes with significant programs.

In the Beaufort Sea, major operators such as Dome, Gulf, and Esso Resources Ltd. were attempting to prove the commercial viability of several highly promising discoveries. These included Gulf's Tarsiut and Esso's Issungnak oil strikes.

Dome, which had drilled or held an interest in several discoveries in open waters of the Beaufort, forecast that it could produce the first oil from the region as early as 1985-86. But that forecast depended heavily on proving commercial reserves at Tarsiut.

By mid-July 1982, Dome had drilled 15 wells in the Beaufort, including four oil strikes and three gas discoveries.

Gulf's Tarsuit discovery, drilled in 1980 in partnership with Dome and other companies, was confirmed in May 1982 by a well with an estimated substained productive capacity of 3,500 b/d of oil. The confirmation well, Tarsiut N-44, found a number of oil bearing zones not present in the Tarsiut A-25 discovery.

Table 4

Economics of nonassociated Alaskan gas

Area	Undiscovered resources: Adequacy chance*	Undiscovered resources: Risked mean	Economic undiscovered resources 10% rate of return: Minimum economic reserve	Chance for min. econ. reserve	Economic resource base†
	Percent	—Trillion cu ft—		Percent	Trillion cu ft
NPRA	79	10.9	§	—	—
Alaskan National Wildlife Refuge	70	3.8	§	—	—
Other North Slope	79	8.7	§	—	—
Beaufort Shelf	88	12.6	§	—	—
Central Chukchi Shelf	62	5.5	§	—	—
Hope Basin	40	1.0	§	—	—
Beaufort Slope	57	4.1	¶	—	—
N. Chukchi Shelf	50	3.5	¶	—	—
N. Chukchi Slope	34	1.2	¶	—	—
Navarin basin shelf	41	5.5	9.5	18	4.5
St. George basin	47	3.8	7.5	16	2.7
Bristol basin	47	2.9	7.5	14	1.8
Norton basin	43	2.5	More than 10	Less than 7	Less than 1.1
Other areas	—	1.6	—	—	—
Total		**67.6**			**Less than 10.1**

*Chance of finding more than 0.05 billion bbl of oil equivalent. †Risked mean economic resource. §10% return not attained. ¶Not technology feasible.
Source: National Petroleum Council

But hopes that the structure held commercial volumes of oil took a setback when a third test was drilled. The Gulf's group Kiggavik A-43, 7 miles east of the confirmation, flowed gas from a new pay for the structure but found no oil.

Data were being reviewed and partners consulted prior to a Gulf decision on whether to drill more wells on the

IPE
ATLAS

NORTH AMERICA

United States

Area: 3,608,672 sq miles
Population: 232,616,497
Capital: Washington, D.C.
Monetary unit: Dollar

THE U.S. PETROLEUM INdustry entered 1983 with a big worry on its mind: the probability of higher state and federal taxes as governments sought added revenues to ease their ballooning budget deficits.

Industry argued that it was in no position to carry a heavier tax burden. Profits during 1982 were running far less than those of the preceding year, and there still were many megabuck projects to undertake despite declining consumption of energy.

Oil producers were operating under the "windfall profits" tax of 1980, the biggest single levy ever imposed on an American business.

Gas producers, transmission lines, distributors, and consumers continued their running dispute over full decontrol of natural gas wellhead prices. Arrayed on one side for immediate, full decontrol were producers and on the other side for a faster decontrol schedule or continued controls were transmission lines, distributors, and consumers.

President Reagan, who as a candidate had endorsed full decontrol, decided in 1982 not to send a decontrol bill to Congress. He cited early in the year "an already heavy legislative agenda." But, he said, natural gas decontrol "remains an essential component of a sound energy policy."

By late 1982, the euphoria that existed in the U.S. petroleum industry immediately after Reagan's election in 1980 had been replaced by concern that some of the President's promises might not be kept.

How states depend on severance tax — **Table 1**

State	Severance tax as percent of state tax revenues 1979	1980	1981	Severance tax 1981 revenue (Million $)	Percent revenue increase 1980-81
Texas	18	23	27	2,197	44
Alaska	21	35	50	1,170	131
Louisiana	21	22	29	815	55
Oklahoma	19	25	27	601	38
New Mexico	19	23	27	323	51
Kentucky	7	8	9	194	10
Florida	2	3	3	169	40
Wyoming	25	27	29	138	30
North Dakota	8	12	23	103	134
Minnesota	2	3	3	99	19
Montana	14	22	21	99	4
Mississippi	3	4	6	88	66

Source: Washington Analysis Corp.

The industry continued to support Reagan, and there was no crack in the philosophical kinship it felt toward him. But industry officials feared that even if some of Reagan's campaign promises materialzed they wouldn't be in quite the pure form that only office seekers and not office holders can vow to achieve.

Lloyd N. Unsell, executive vice-president of the Independent Petroleum Association of America (IPAA), in late 1982 cited producers' concern with Reagan's statement that he "intends to get rid of the windfall profits tax when it is fiscally feasible." Taking into account a deep economic recession in the country, Unsell said, "It looks as if the expiration date of the tax will arrive before fiscal feasiblity."

IPAA and other groups of producers and royalty owners earlier had mounted a legal challenge to the tax on decontrolled crude oil revenue gains. The measure, passed during Democratic President Carter's administration, was designed to raise $227.7 billion in federal revenues. The levy is to phase out during a 33 month period beginning in 1988 or when the total tax revenue reaches the government goal, whichever is later.

Higher taxes? The annual meeting of the American Petroleum Institute (API) in mid-November 1982 underscored the industry's worries about higher taxes.

API Pres. Charles J. DiBona warned the meeting in Houston, "Given the way legislation is enacted these days, we could be targeted, shot, and dragged away with barely enough time to realize it is nigh noon."

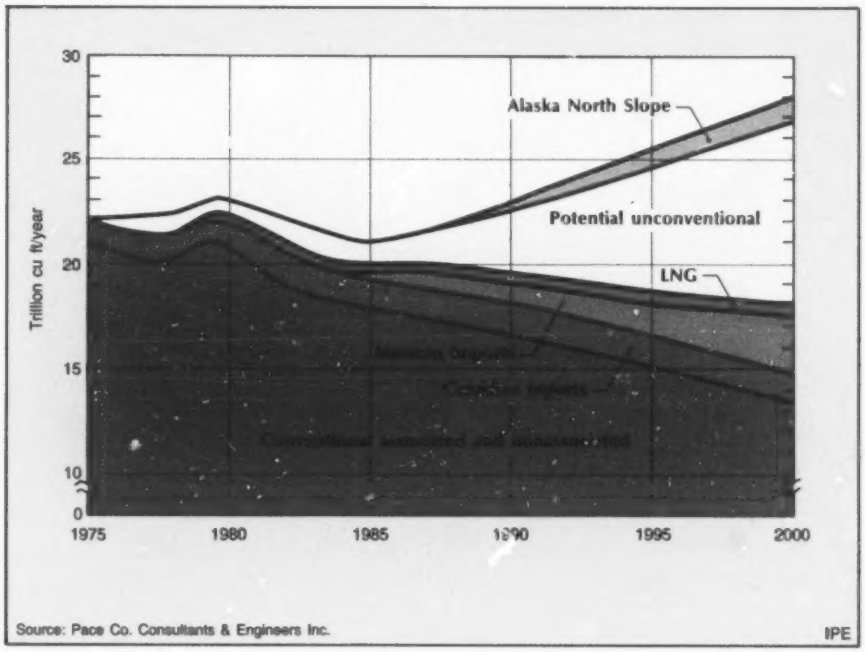
Projections for increasing federal budget deficits and the harm they could inflict on the U.S. economy had raised calls among leaders in Congress for increased taxes on the oil and gas industry.

"We are in for a hell of a fight," DiBona declared.

His statement came shortly after Nov. 2 general elections in which Democrats, generally more liberal than Republicans and more likely to back higher taxes on industry, gained 26 seats in the House of Representatives. Republicans retained control of the Senate for the 98th Congress which convened in January

Outlook for U.S. natural gas supply

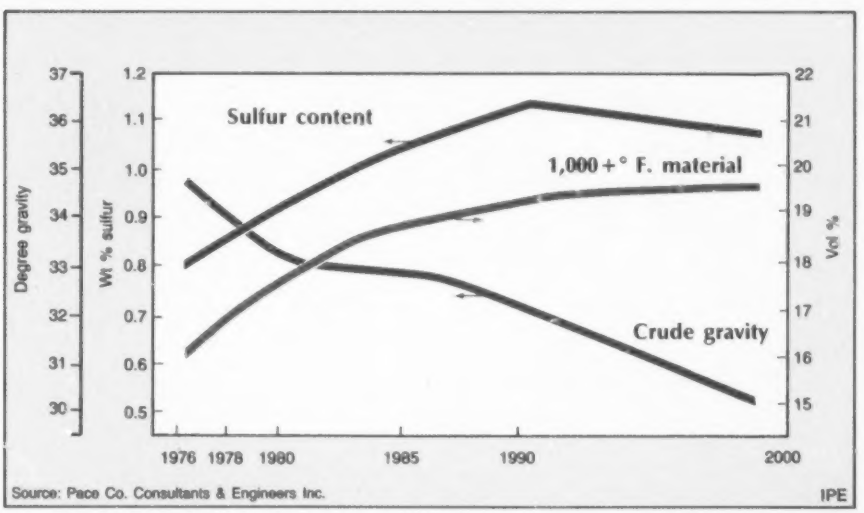
2



Source: Pace Co. Consultants & Engineers Inc. IPE

How U.S. refinery feed quality will change

3



Source: Pace Co. Consultants & Engineers Inc. IPE

eries could total more than 950 trillion cu ft, equal to about 170 billion bbl of oil. This volume represented about 60% more gas than the U.S. had produced during the last 160 years. And it was equal to about 50 years of production at current levels.

"Compared with continuation of the NGPA," API said, "total phased decontrol would by 1985:

- Increase production from existing wells by about 1.5 trillion cu ft/year, equal to about 730,000 bbl of oil.
- Stimulate production from new fields of about 500 billion cu ft/year, equal to about 240,000 bbl of oil.

"The increased production—about 2 trillion cu ft/year—is equal to more than 10% of current natural gas production, nearly 20% of current U.S. oil imports, and about 50% of the world oil shortfall at the height of the Iranian supply cutoff in 1979."

The association declared that moving toward "a truly free market in natural gas" would encourage increased exploratory drilling and production much the way decontrol of oil speeded oil exploration/production.

Another large industry group, the American Gas Association (AGA), opposed decontrol of flowing gas. And the Interstate Natural Gas Association of America (Ingaa) supported phased decontrol of new and old gas.

Gas transmission lines and distributors feared further losses of markets to competing lower priced fuels such as fuel oil. And some gas purchasers were invoking "market out" clauses in their contracts with producers because they couldn't sell high cost gas.

In addition, some purchasers feared a big price spike after partial decontrol in 1985, further eroding the market for natural gas.

But Merrill Lynch Pierce Fenner & Smith Inc., New York, issued a report early in 1982 that predicted there will be no price "fly-up" in 1985. Partial decontrol will, however, spur a definite change in U.S. gas drilling patterns, the firm said.

Merrill Lynch said, "At the end of 1984, based on an annual inflation rate of 8%, we estimate that the average price of natural gas will be $3.75/MMBTU. Consequently, if the average wellhead price after decontrol is in line with our estimate of $4-4.25/MMBTU, a dramatic price spike will not occur.

"In fact, our estimates indicate that if the NGPA remained in effect beyond Jan. 1, 1985, the average price of gas in that year would approximate $4-4.25/MMBTU, which also is our decontrolled price estimate."

The firm predicted that decontrol will produce "a substantial slowdown" in drilling to 15,000 ft and deeper while kicking off accelerated drilling to depths of about 10,000 ft. Such development would hurt deep drillers and producers. Gas production from pays 15,000 ft deep and deeper qualify for uncontrolled prices under the NGPA.

Merrill Lynch said, "If our projections are correct, the excessive cost of drilling the majority of deep wells may render those wells uneconomical to drill. This could put an end to exploration in the deep Tuscaloosa trend of South Louisiana as well as some portions of the Anadarko basin."

Also after decontrol, reserves addi-

Table 2

Capacity addition requirements

	(1,000 b/d)
Resid hydrotreating	500
Heavy oil cracking	100
Visbreaking	200
Delayed coking	350
Lube oil	20
Hydrogen (MMcfd)	600
Sulfur recovery (standard tons/day)	6,000

Source: Pace Co. Consultants & Engineers Inc.

tions will catch up with production, the firm added. In the meantime, the outlook is for continued increases in reserves additions as the number of new gas wells rises (Fig. 1).

Effect on refiners. It wasn't only producers, pipelines, and consumers who had their eyes on the effect of natural gas price decontrol. Refiners had a stake in the issue, too.

That's because deregulation of wellhead prices, whether speeded or not, will trim residual fuel oil demand in the U.S., said a study by Pace Co. Consultants & Engineers Inc., Houston.

The Pace report, presented during the 1982 annual meeting of the National Petroleum Refiners Association, predicted that the reduction in demand for resid will prompt refiners to strengthen a major trend under way—construction of resid conversion units. But refiners won't have enough of this conversion capacity in place in 1985 to meet desired product levels from the crude slate that will be available then, Pace said.

Pace predicted that premium markets for natural gas (household/commercial, petrochemicals, and others) will show modest growth to 18 trillion cu ft/year by 1990. Natural gas supply, however, will

Table 3

Outlook for federal and Indian royalties*

Fiscal year	Outer Continental Shelf	Onshore —oil and gas— Federal	Onshore —oil and gas— Indian	Onshore —mining— Federal	Onshore —mining— Indian	Total royalties	WPT†	Total revenues
	Million $							
1982	3,077	693	143	97	29	4,039	958	4,997
1983	3,444	756	146	111	29	4,488	983	5,471
1984	3,798	827	153	124	31	4,933	1,022	5,955
1985	5,557	1,107	184	172	37	7,057	1,058	8,115
1986	6,387	1,240	194	202	43	8,066	1,086	9,152
1987	8,512	1,562	225	428	65	10,792	1,108	11,900
1988	9,116	1,677	231	500	74	11,598	1,131	12,729
1989	9,877	1,841	246	577	84	12,625	1,008	13,633
1990	10,888	2,097	251	705	98	14,039	586	14,625

*Based on price projections by Office of Management and Budget and Department of Interior.
†Windfall profits tax.

Source: U.S. Geological Survey

Santa Maria basin off California shapes up as

AN AREA OFF SOUTHERN California was shaping up during 1982 as the hottest exploration/development province in the U.S.

As the year drew to a close, a group led by Texaco U.S.A. disclosed hefty oil flows in a well that further delineated a giant structure off the Point Arguello-Point Conception area of the Santa Maria basin. Six discovery and confirmation/delineation wells in the area "indicate one of the largest oil discoveries in recent years in the U.S.," Texaco said.

And Standard Oil Co. of California, whose Chevron U.S.A. Inc. subsidiary had drilled an earlier discovery in the area, said tests of its wells "indicate the presence of a giant oil field."

Industry sources estimated the field's reserves at about 500 million bbl, with some estimates running as high as 1 billion bbl.

Development plans were being laid, and exploration was fanning out in federal waters of the Santa Barbara Channel. Eight mobile rigs were working in the offshore Santa Maria basin at yearend 1982.

California planned to offer leases for sale in state waters in the area in a move that could add more sparks to industry's exploration/development campaign in the basin.

Hueso area. The Texaco group's latest well in its Hueso area, 3 OCS P-0315, found thick pay and yielded sizable oil flows.

The delineation well flowed at individual rates of as much as 1,900 b/d of 11-23° gravity oil through 1 in. choke from multiple pay zones in the Miocene Monterey, the basin's key pay. Site was about 1 mile southwest of Texaco's Hueso discovery well. The latest well, drilled to 8,500 ft in 1,043 ft of water by the Glomar Atlantic drillship, cut an oil column of more than 1,200 ft. Pay depths weren't disclosed when results were reported in November 1982.

Texaco unveiled results of its Hueso discovery and a confirmation well the preceding June.

The firm gauged individual rates of as much as 4,200 b/d of oil from multiple zones in the discovery, 1 OCS P-0315, and more than 3,000 b/d from multiple zones in the confirmation, 2 OCS P-0315. Productive zones in each well occurred within an interval more than 1,000 ft thick.

The company then announced tentative plans to drill 20-50 wells from one or two platforms yielding as much as 100,000 b/d by 1986.

It led to a design contract to Brown & Root Inc. for a 48 slot platform to produce at least 50,000 b/d. Plans called for platform installation and drilling to begin late in 1985, with production to get under way a few months later.

Texaco is operator with 35% interest in the $35.3 million Tract P-0315 acquired during OCS Sale 48. Its partners are Pennzoil Co. 25%, Sun Exploration & Production Co. 20%, and Koch Exploration Co. 20%.

Point Arguello. The Texaco group's Hueso discovery tapped the same structure found earlier 3 miles to the east by a group led by Chevron. The Chevron group called its discovery Point Arguello.

And Chevron, operating in 50-50 partnership with Phillips Petroleum Co., later drilled a northwest extension to the areas, further confirming the structure's status as a giant field. Site for the extension was on the most expensive tract in U.S. offshore leasing history.

The Chevron group disclosed a few details of its Point Arguello discovery in the fall of 1981. It also said two other wells to the east produced oil on structures separate from the Point Arguello strike. All were drilled early in 1981.

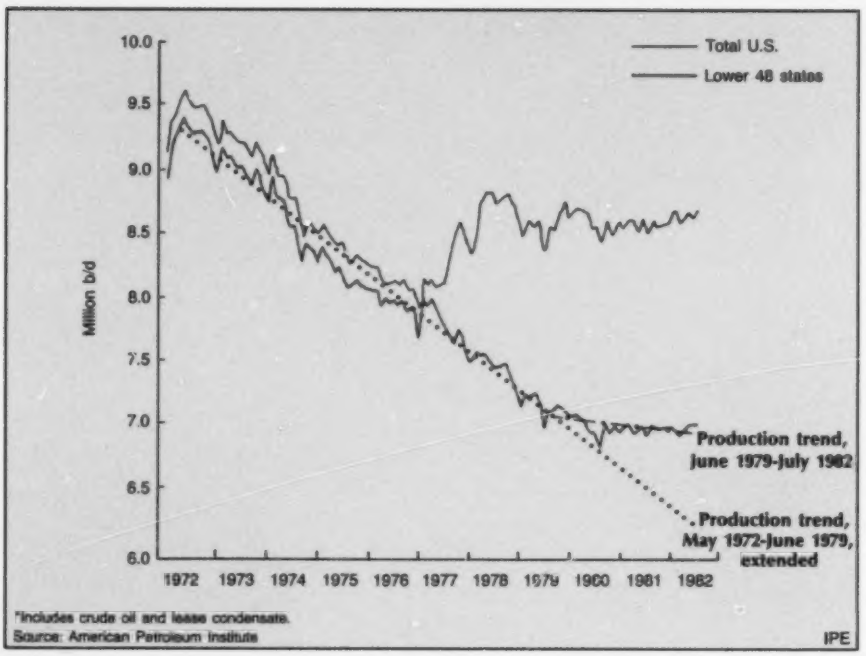
Then, in October, 1982, Chevron reported additional test results from its point Arguello discovery and a confirmation well.

The discovery well, 1 OCS P-0316, recovered oil and gas during five tests of intervals in the Montery between 6,505 and 7,900 ft. Combined flow rates amounted to about 6,480 b/d of oil and 1.68 MMcfd of gas through chokes ranging from 32/64 to 56/64 in. Pay thickness was about 1,075 ft, and oil gravity ranged from 18 to 20°.

A confirmation well, 2 OCS P-0316, drilled about 1 mile to the northwest, gauged hefty flows on tests of three Monterey zones at 7,530-8,285 ft. Flows ranged from 820 to 1,512 b/d of oil and 250 to 300 Mcfd of gas through 32/64 in. choke for a combined flow of 3,800 b/d and 860 Mcfd. Gravity varied from 17.7° to 29.0°.

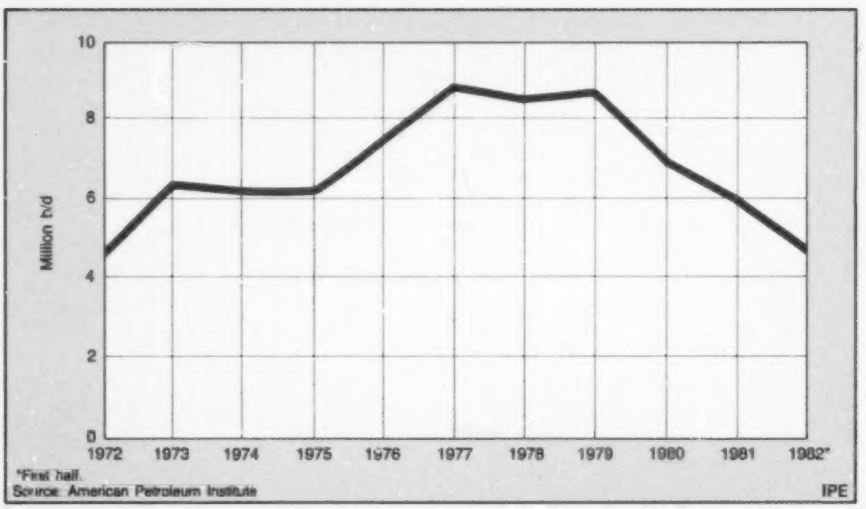
The Chevron group said it expected to let a construction contract during first half of 1983 for a 48 slot platform to develop Point Arguello field in Tract 316. Design engineering services con-

The picture for U.S. oil production* 7



*Includes crude oil and lease condensate.
Source: American Petroleum Institute
IPE

How U.S. oil imports have dropped 8 0



*First half.
Source: American Petroleum Institute
IPE

Percentage increases were the largest ever recorded by the U.S. petroleum industry.

The number of oil wells drilled during 1981 rose to 37,671 from 27,026 in 1980, a 39.4% increase. The previous record was 31,567 in 1955.

There was a 13.8% increase in 1981 in the number of gas wells drilled. API counted 17,894 new gas wells, compared with a record 15,730 a year earlier.

Dry holes totaled 22,973 in 1981, compared with 18,089 in 1980. The 1981 total broke the previous record of 21,797 set during 1956.

Of total wells drilled, 15,168 were exploratory, representing a 27.3% increase from the 1980 total of 11,916. A breakout showed oil completions up 38.3% at 2,219, gas wells up 20.2% at 2,366, and dry holes up 26.9% at 10,583.

Exploratory footage totaled 89,087,220 ft, representing a 27.4% increase from the 69,948,320 ft drilled during 1980.

Depth of the average exploratory oil well increased to 5,979 ft in 1981 from 5,787 ft in 1980.

Oil production, imports. U.S. crude oil production during December 1982 amounted to 8.657 million b/d, up a little more than 1% from December 1981.

The September 1982 report by API pointed out that mid-1982 oil production was "an impressive" 800,000 b/d above the level that would have prevailed if the decline of the last decade had continued (Fig. 7).

And it reminded the public that 800,000 b/d is more oil than the U.S. shortfall that led to long lines at U.S. service stations during the supply crisis of 1979.

API said, "President Carter took a crucial, positive step by gradually removing government price and allocation controls from crude oil—controls which had begun in August 1971. President Reagan wisely completed the decontrol process in January 1981.

"Because of decontrol, the U.S. now has more oil production."

At the same time, the country had cut oil imports almost in half since 1977. By mid-1982, oil imports were near the level of imports before the Arab oil embargo of the early 1970s (Fig. 8).

API attributed the decline in imports to increased U.S. energy production and less energy consumption. Imports dropped from an average of 8.4 million b/d during 1979 to 5.7 million b/d in 1981.

The association said, "By following

Table 4

Planning areas

Area	Million acres
Atlantic	
North	139
South	99
Subtotal	**238**
Gulf of Mexico	
Western	35
Central	46
Eastern	58
Subtotal	**139**
Pacific	
Southern California	22
Central and northern Calif.	37
Subtotal	**59**
Alaska	
Gulf of Alaska	133
Kodiak	89
Cook inlet	8
Shumagin	84
North Aleutian basin	32
St. George basin	70
Navarin basin	37
Norton basin	25
Hope basin	12
Barrow arch	30
Diapir field	49
Subtotal	**569**
Total	**1,005**

Source: Interior Department

Wellhead gas prices under NGPA

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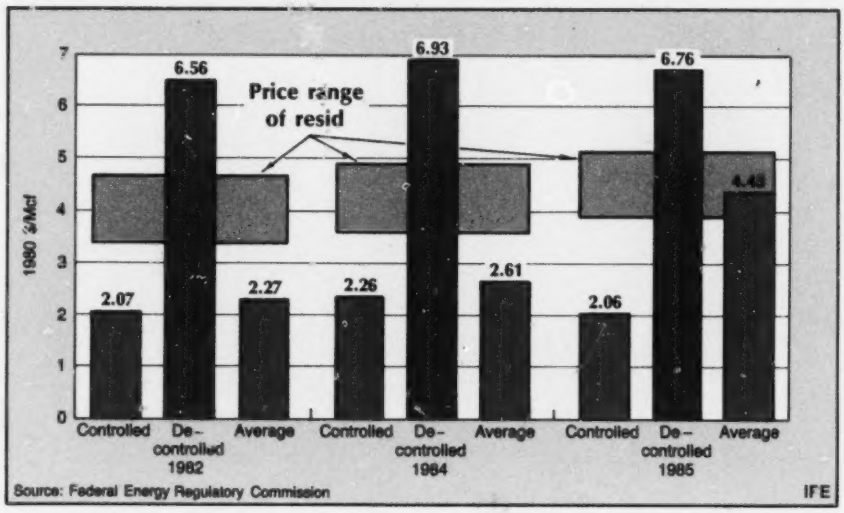


Table 5

Outlook for average U.S. natural gas prices

Year	Price at the wellhead	Price at retail				
		Residential	Commercial	Industrial	Power plant	Average
	1982 $/MMBTU					
1982.....	2.46	4.75	4.19	3.78	3.62	4.14
1983.....	2.64	4.92	4.33	3.95	3.78	4.30
1984.....	2.80	5.10	4.47	4.11	3.90	4.46
1985.....	3.90	6.14	5.46	5.16	4.93	5.51
1986.....	3.78	6.05	5.35	5.09	4.87	5.43
1987.....	3.64	5.97	5.25	5.00	4.80	5.34
1988.....	3.52	6.01	5.25	5.01	4.78	5.34

Source: American Gas Association

In related action, Northern Natural Gas Co. sought to trim the cost of take or pay clauses in its purchase contracts and temporarily suspended pursuit of gas acquisitons.

Northern and Northwest also asked FERC to authorize temporary reductions of proposed rate increases then under FERC consideration.

Those and other moves reflected gas transmission lines' squeeze between shrinking markets and ballooning costs of operations and wellhead purchases.

But AGA issued a report in September 1982 showing that natural gas price increases during the coming years will be markedly lower than those experienced during the past decade. While wellhead prices in 1992 will be 10 times the 1972 level, they will be only 60% more than they are at present, the gas industry association said.

AGA predicted a rise to $3.52/MMBTU in 1988 at the wellhead from $2.46 during 1982. During the same time, the association as said, average price to customers will rise to $5.34/MMBTU from $4.14 (Table 5).

C.M. (Mike) Butler, chairman of FERC, said in October 1982 that a key to increased gas sales in the U.S. is the use of gas as boiler fuel.

He pointed out that the U.S. gas market was made up of residential/commercial, 42% of sales, process gas 20%, feedstock 13%, and boiler fuel 25%.

Butler said the boiler fuel market is "crucially significant" for two reasons. First, it represents the only significant opportunity for growth in the U.S. market. And second, boiler fuel is the marginal market because most industrial boiler fuel users have dual fuel capability. This means that the boiler fuel segment drives demand by being able to enter and leave the market rapidly. And this limits gas prices to the BTU equivalent of residual fuel oil.

Under the Natural Gas Policy Act, Butler said, average U.S. gas prices will rise to $4.45/Mcf in 1980 dollars by 1985, clearly in the competitive range with resid (Fig. 13).

Lead phasedown. Starting the first week of November 1982, U.S. refiners were operating under two new, final standards for lead in gasoline. The two tier clock was scheduled to run out June 30, 1983.

After that date, all refiners would not

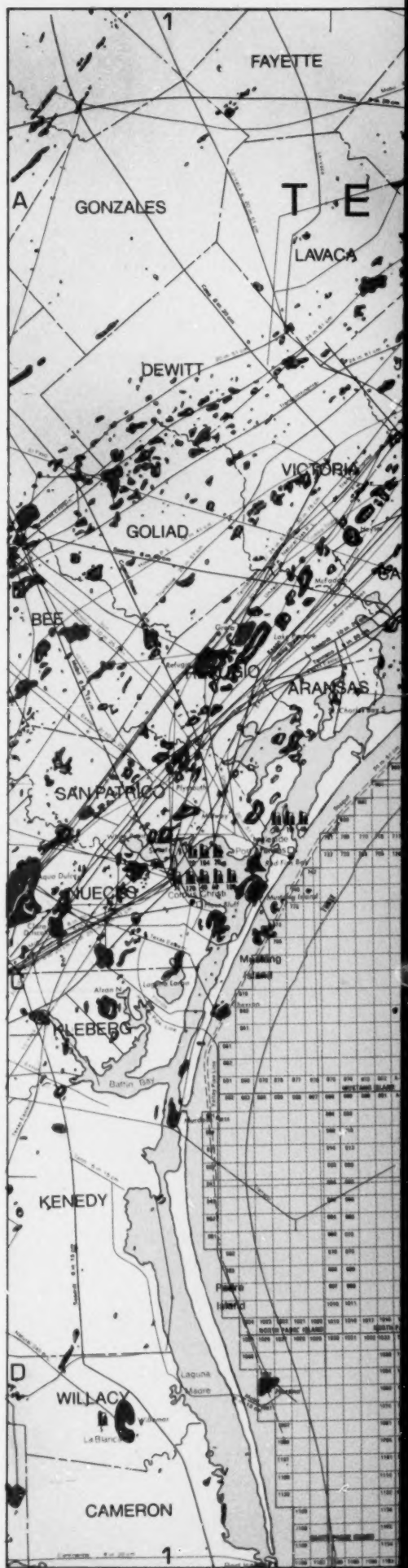


Table 1

Breakout of wells drilled in Canada during 1981

Province	Oil producers Number	Oil producers Footage	Gas producers Number	Gas producers Footage	Total producers Number	Total producers Footage	Abandoned Number	Abandoned Footage	Suspended Number	Suspended Footage	Total Number	Total Footage
Exploratory wells												
Western Canada												
Alberta	417	2,178,317	1,081	5,155,459	1,498	7,333,776	837	3,857,238	17	105,433	2,352	11,296,447
British Columbia	4	19,245	70	468,602	74	487,847	67	447,008	3	27,248	144	962,103
Manitoba	18	56,177	0	0	18	56,177	15	57,838	0	0	33	114,015
N.W.T. - Arctic Islands	3	26,772	1	8,120	4	34,892	7	64,675	0	0	11	99,567
Saskatchewan	298	833,363	20	49,823	318	883,186	212	604,793	4	8,671	543	1,496,650
Eastern Canada												
Nova Scotia	0	0	0	0	0	0	1	8,655	0	0	1	8,655
East Cost Offshore	4	61,916	2	26,837	6	88,753	3	40,876	0	0	9	129,629
Ontario	0	0	7	11,958	7	11,958	41	80,567	0	0	48	92,527
Quebec	0	0	1	4,495	1	4,495	4	22,224	0	0	5	26,719
Total Canada Exploratory	744	3,175,791	1,182	5,725,295	1,926	8,901,085	1,187	5,183,875	24	141,352	3,137	14,226,312
Development Wells												
Western Canada												
Alberta	1,066	4,202,293	2,004	5,261,355	3,070	9,463,648	409	1,538,356	1	8,727	3,480	11,010,732
British Columbia	23	130,259	25	144,400	48	274,659	16	93,734	1	6,726	65	375,118
Manitoba	29	86,152	0	0	29	86,152	0	0	0	0	29	86,152
N.W.T - Arctic Islands	2	27,789	0	0	2	27,789	0	0	0	0	2	27,789
Saskatchewan	214	622,484	5	11,371	219	633,855	35	117,087	0	0	254	750,942
Eastern Canada												
East Coast Offshore	0	0	0	0	0	0	0	0	0	0	0	0
Ontario	6	2,838	69	94,370	75	97,208	53	88,130	1	1,834	129	187,172
Quebec	0	0	0	0	0	0	0	0	0	0	0	0
Total Canada Development	1,340	5,071,815	2,103	5,511,496	3,443	105,583,311	513	1,837,307	3	17,287	3,959	12,437,905
Grand Total Wells	2,084	0	3,285	0	5,369	0	1,700	0	27	0	7,096	0
Adjustments-deeper pool*	−68		−141		−209		−50				−259	
Service											67	250,984
Total other tests											6	16,818
Miscellaneous											17	22,077
Grand total completions	2,016	8,247,606	3,144	11,236,791	5,160	19,484,396	1,650	7,021,182	27	158,639	6,927	26,664,217

*Deeper pool tests are counted under two well classifications because part of the hole is development and part is exploratory.
Source: Canadian Petroleum Association

ing 1981, only 40% of authorized volumes.

Domestic sales of natural gas also declined, falling 2% to 116 million cu m/day in 1981.

A tally by CPA showed that Canada's oil imports fell to 82,000 cu m/day during 1981 from 89,000 cu m/day in 1980. Oil exports declined to 26,000 cu m/day from 34,000 cu m/day. This left the country a net importer of about 56,000 cu m/day during 1981, or about 20% of refinery receipts of crude oil.

CPA said, "Increasing oil imports and declining gas exports combined to seriously affect Canada's balance of trade in oil and gas. For the first time in many years, Canada's exports of crude oil and natural gas did not pay for imports of crude oil. The deficit in the oil and gas account was $1 billion."

Natural gas surplus. Canadian authorities moved during 1982 to help work off industry's surplus of natural gas. Much of the surplus occurred in Alberta, Canada's biggest producing province (Fig. 4).

The National Energy Board (NEB) decided in May to change its procedures for determining surpluses, helping to pave the way for increased export approvals.

Under NEB's revised formula for determining volumes surplus to Canada's long term needs, the board will forecast actual exports under existing licenses. It previously based its calculations on volumes approved for export rather than volumes actually sold.

NEB also lifted the so-called current deliverability test, which counted in surplus reserves calculations only those reserves connected to pipelines. Under the new ruling, NEB will consider gas volumes awaiting pipeline connection as well as possible future discoveries.

The board's decisions followed hearings at which most of about 60 natural gas industry representatives urged changes in NEB procedures to permit more exports to the U.S.

Some industry spokesmen said Canada's border price of $4.94/Mcf was too high to compete with domestic supplies in the U.S.

In addition, the federal government in October 1982 signed an agreement with Gaz Inter-Cite Quebec Inc. under which Ottawa will provide as much as $500 million during the next few years to allow Gaz Inter-Cite to lay pipeline laterals extending gas penetration in the province.

Earlier in the year, the Alberta government agreed to take part in a $500,000 feasibility study for a large scale natural gas storage project designed to alleviate the problems of low gas sales by producers in the province.

Table 2

Canada's light oil products demand

	1979	1982*	1985*
	b/d		
Motor gasoline	660,000	597,950	513,500
Diesel	251,600	237,800	256,750
Heating oil	275,700	208,500	177,490
Jet fuels	79,270	70,650	68,930
Other	3,430	5,100	3,330
Total	**1,270,000**	**1,120,000**	**1,020,000**

*Projected.
Source: Shell Canada Products Co.

$1.2 billion.

Spending for exploration on provincial lands fell 25% to $2.6 billion, and spending for all exploration dropped to $3.8 billion from $4.1 billion in 1980.

Funds flowing out of Canada totaled a net $5.1 billion during 1981, much of it due to the cost of acquisitions. Foreign ownership of the industry declined to 67.2%.

Alsands victim. Among the victims of declining economics in the petroleum industry was a $13 billion proposal by the Alsands group to build a 137,000 b/d oil sands project at Fort McMurray, Alta.

The group, with only Gulf Canada and Shell Canada remaining as private members, disclosed in May 1982 that it had decided to kill plans for the project that would have given Canada its third commercial scale oil sands operation.

Five other members earlier withdrew from the project, citing high costs and a weak outlook for petroleum demand. Withdrawing were Chevron Standard Ltd., Amoco Canada Petroleum Ltd., Shell Explorer Ltd., Dome, and Hudson's Oil & Gas Ltd., a Dome subsidiary. Combined, they had held a 50% interest.

That left Shell Canada with 25%, Gulf Canada 8%, and Petro-Canada 17%.

The remaining private sponsors rejected a financing and tax proposal from the federal and Alberta governments designed to salvage the project.

Ed Czaja, Alsands president, said, "We have been working to make this project a reality for more than 4 years.

"Since 1978 we have watched the cost of the project increase dramatically. We have seen continuing high inflation, rising interest rates, and reduced cash flow of the sponsoring companies.

"There has been the downturn in international oil prices, emphasizing project risk and uncertainty. We have felt the loss of five of eight members of the consortium.

"All of these factors have combined against Alsands."

Hibernia marks new era in Canadian oil

DISCOVERY OF GIANT Hibernia oil field off Canada's east coast in January 1980 marked the beginning of a new era for the Canadian petroleum industry.

The field, with reserves estimated at 1-2 billion bbl of oil and 2 trillion cu ft of gas, was the first commercial reservoir found by the industry after a long search off the east coast. And a top official of the Canadian industry said Hibernia, combined with the Hebron oil discovery on a separate structure 20 miles to the southeast, gave the East Newfoundland basin "a potential similar to the North Sea."

But 2 years after its discovery, Hibernia extracted a terrible price from the industry.

On the night of Feb. 14-15, 1982, a mighty storn struck the Hibernia area on the Grand Banks, 200 miles east of St. John's, Newf. High winds and high seas capsized the big Ocean Ranger semisubmersible drilling rig, killing all 84 persons aboard.

It was the worst offshore accident since Mar. 27, 1980, when a record 123 persons died in the capsize of the Alexander L. Kielland semisubmersible accommodation rig in Ekofisk field of the Norwegian North Sea.

The Ocean Ranger tragedy spawned new sets of regulations or recommendations for safety procedures off Canada and the U.S., along with lawsuits by the victims' families seeking hundreds of millions of dollars in damages.

Most of the bodies were never recovered.

Near yearend 1982, divers and a remote controlled submersible had finished their inspection of the rig. It was lying on its upper deck in 260 ft of water, 300 ft from its drillsite, with all deck houses and superstructures swept away or crushed.

The U.S. House of Representatives and the Canadian and Newfoundland governments conducted hearings on the accident. Ottawa and Newfoundland laid conflicting claims to ownership and jurisdiction of resources off the province.

Ocean Ranger. A smashed porthole in the Ocean Ranger's ballast control room probably was responsible for the sinking of the rig, Hugh J. Kelly, president of Ocean Drilling & Exploration Co. (Odeco), told a U.S. House committee hearing 1 month after the accident.

The rig, operating under contract to a group led by Mobil Oil Canada Ltd., was owned by Odeco Drilling of Canada Ltd., an Odeco subsidiary. It was billed as the world's largest semisubmersible rig (Fig. 1).

The unit sank during the early morning hours of Feb. 15 while at work on Mobil et al. Hibernia J-34, the fifth appraisal well in the field (Fig. 2). Site was 46° 43′ 34.62″ N. Lat., 48° 50′ 11.15″ W. Long.

Kelly said seawater entering through the porthole short circuited ballast control room equipment 6 hr before the crew abandoned the rig. Although rig personnel later reported by radio that the ballast control panel was back in working order and the control room hatch was closed, the ballast control system somehow failed as the storm grew worse.

"Everything we know points to a stabilization problem" as the cause of the accident, Kelly told the House hearing.

The control room was below deck level on a starboard stabilizing column. It was 32 ft above water level, within the range of storm waves.

Witnesses said the storm packed winds of as much as 79 knots and whipped up 36 ft waves. It was a typical winter storm off Newfoundland. The Ocean Ranger, which had safely ridden out a worse storn in the Hibernia area 1 month earlier, was designed to withstand 115 mph winds and 110 ft waves.

One of the last reports from Ocean Ranger said the rig was listing 12-15°.

At 1:30 a.m. the final call went out from the vessel. The crew was abandoning ship. The rig disappeared from radar screens about 3 a.m.

Efforts to rescue the crew of Ocean Ranger were thwarted by continuing rough weather. And at the end of the tragedy, only 22 bodies were recovered. Post-mortems showed that all had frozen to death in Atlantic waters.

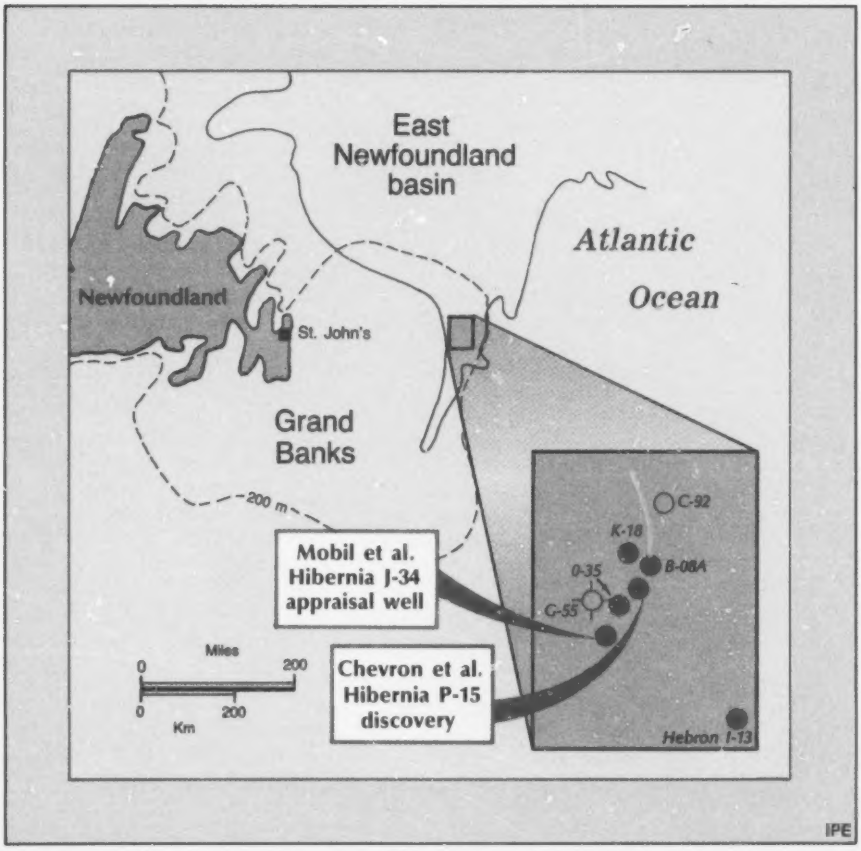
Eight or nine men lived long enough

Offshore survival times

Water temperature (° F.)	Exhaustion or unconsciousness (Time)	Expected survival* (Time)
32.5	<15 min	<15-45 min
32.5-40	15-30 min	30-90 min
40-50	30-60 min	1-3 hr
50-60	1-2 hr	1-6 hr
60-70	2-7 hr	2-40 hr
70-80	3-12 hr	3 hr to indefinite
>80	Indefinite	Indefinite

*Without exposure suit.
Source: U.S. Coast Guard

The Mobil group's Hibernia field 2



son, president of Chevron Standard Ltd., told a summer 1982 meeting of the American Association of Petroleum Geologists in Alberta that results from the Hibernia and Hebron discoveries give the East Newfoundland basin "a potential similar to the North Sea."

Chevron found Hibernia with its Hibernia P-15 wildcat, the first oil well capable of commercial production on the continental shelf off eastern Canada.

Henderson said, "Drilling has confirmed the presence of a giant oil field which appears to contain recoverable reserves of 1-2 billion bbl."

Production tests showed that wells will be capable of producing more than 20,000 b/d each. The Hibernia group at that time had drilled five delineation wells on the structure—four suspended oil wells and one dry hole.

The structure is a large north-northeast trending rollover anticline bounded on the west by a major listric growth fault. It is divided into a number of separate blocks by transverse faults. A major mid-Cretaceous unconformity truncates the crest of the structure.

The most productive reservoirs are Lower Cretaceous sandstones with porosities ranging from 17% to more than 30%.

The field lies near the southeast end of the Jeanne d'Arc subbasin, where thickness of Mesozoic and Cenozoic sediments ranges to more than 39,000 ft.

Henderson estimated start of production by 1989-90, based on semisubmersible or fixed platforms.

Neil Windsor, Newfoundland's minister of development, reported during the 1982 Offshore Technology Conference in Houston that Hibernia dileneation drilling had established a "commercially exploitable" field of 1.85 billion bbl of recoverable oil and 2 trillion cu ft of recoverable gas. He said the field covered an area of about 30 sq miles and represented about one-third of the current conventional oil reserves in Canada, "making it the largest oil field ever discovered in our country."

Capital cost of a Hibernia production/transportation system will be $4-6 billion, Windsor estimated. It likely will be made up to four to six floating production facilities, one or two storage tankers, four to 10 subsea production templates and manifolds, extensive intrafield flow lies, six to eight shuttle tankers, and many marine support vessels.

Working interests in the field are Mobil 28.12%, Gulf Canada Resources Inc. and Petro-Canada Exploration Inc. 25% each, Chevron 16.41% and Columbia Gas Development of Canada Ltd. 5.47%. Chevron drilled the field discovery on a farmount from the Mobil group.

Dispute over jurisdiction. The Canadian government in May 1982 took the question of ownership and jurisdiction over Hibernia field to the Supreme Court of Canada. It was the latest step in Ottawa's running battle with Newfoundland over which government controls petroleum resources off the province.

The decision to submit the question to the highest court in Canada angered Newfoundland, which earlier had referred the question of ownership to its own provincial Supreme Court for a ruling.

Canadian Prime Minister Pierre Trudeau said the federal move was made in an effort to speed settlement of the dispute, which could delay exploration/development off Canada's east coast. The warning of a delay also had been sounded by spokesmen for the Canadian petroleum industry.

The federal government asked the Supreme Court to decide whether Ottawa or Newfoundland has the right to govern exploration and development of Hibernia resources.

The court gave no indication of when it might rule on the question.

Well results off Ivory Coast*

Well	Distance from Espoir A-1X discovery (miles)	Water depth (ft)	Status	True vertical producing interval (ft)	Flow rate(s)
C1-5*	1 NW	449	On production	8,080-8,262	3,962 b/d oil, 1.66 MMcfd gas
A-6X	13.7 E	1,850	P&A	—	—
C1-4X	3.2 NW	353	P&A	6,702-6,781	6.9 MMcfd gas
B1-1X Bis	15.8 W	330	P&A	7,172-7,860	52.3 MMcfd gas, 564 b/d cond.
C1-8*	4.1 NW	365	On production	7,936-8,130 6,798-6,902	346 b/d oil, 4.2 MMcfd gas 4,437 b/d oil, 2.14 MMcfd gas
A-7*	0.9 E	450	On production	10,620-11,001	4,018 b/d oil, 1.83 MMcfd gas
C1-7*	0.8 NNE	460	Completing		
B-3X	58 ESE	1,270	P&A	7,540-7,590	26.47 MMcfd gas, 567 b/d cond.
C1-6X	1.5 N	498	P&A	Oil shows	
B1-3X	18.2 W	347	P&A	Dry	
B1-4X	10 WNW	371	P&A	Dry	

*Early production system wells, September 1982.
Source: Phillips Petroleum Co.

IPE

IVORY COAST

AREA: 127,520 sq miles
POPULATION: 8,300,000
CAPITAL: Abidjan
MONETARY UNIT: CFA Franc

OIL PRODUCTION IS UNDER way from Espoir field, operated by a Phillips Petroleum Co. subsidiary off Ivory Coast.

Production, which began in the late summer of 1982, averages 20,000 b/d from five wells.

The wells also are flowing about 8 MMcfd of gas. Some of the gas is being used to fuel production equipment. The rest is being flared.

Phillips describes the crude oil as light and sweet. It is being sold or traded in international operations. Some might be processed at the Abidjan refinery.

First Espoir production came less than 3 years after discovery of the field.

Early production. Five subsea wellheads have been tied to the early production system, all but one drilled directionally in 365-500 ft of water.

The wells tied into the system are C-18, C1-5, A-7, A-5, and C1-7.

The early production program will provide engineering and operating data useful in planning possible future development.

The central production facility is a jack up drilling rig, Dan Duke, which has been converted to a temporary production platform.

Oil is moved through a 12 in. flow line about 2 miles to a moored very large crude carrier, Phillips Enterprise. Oil is then transferred to shuttle tankers for transportation to market. The wells are within 4.2 miles of the Dan Duke.

Latest wells. In addition to drilling operations since May 1982 in the greater Espoir field area, Phillips completed and plugged a gas/condensate discovery far from Espoir.

The Phillips group's B-3X was drilled in 1,270 ft of water 58 miles east-southeast of the A-1X Espoir discovery.

B-3X flowed 26.47 MMcfd of gas and 567 b/d of condensate through ¾ in. choke from 7,540-90 ft.

The Phillips group holds three production sharing contracts with the Ivory Coast government to explore and develop more than 3.5 million contiguous acres offshore and southwest of Abidjan. The contracts cover Blocks A-B, B1, and C1.

Initial interests in the three contracts are Phillips Petroleum Co. Ivory Coast 57.5%, Agip (Africa) Ltd. 22.5%, Sedco Inc. 10%, and Petoci, Ivory Coast's national oil company, 10%.

Two of the contracts provide an opportunity for the Ivory Coast government to increase its share of costs and production to 60% in about 470,000 acres in Blocks B1 and C1. This would reduce the other companies' interests in that acreage proportionately.

KENYA

AREA: 224,960 sq miles
POPULATION: 17,150,000
CAPITAL: Nairobi
MONETARY UNIT: Shilling

KENYA SOUGHT BIDS IN 1982 on six blocks it opened to foreign operators.

The blocks involve four onshore tracts, one onshore and offshore tract, and one offshore tract, all in Kenya's eastern basin.

The northwest portion of Block 3 has been extended.

Other blocks will be offered for international bids as surveys under way are evaluated.

Andrew N. Ligale, permanent secretary of Kenya's energy minister, said the government's policy is to encourage private investment in development of the country's oil and gas resources.

The country spends about one-third of its foreign exchange earnings to buy crude oil from Middle East producers.

"My ministry believes that the sedimentary basin of eastern Kenya has been given adequate attention and that there is need for this important round of acreage promotion," Ligale said.

Only 16 wells have been drilled in the eastern Kenya basin and offshore, the minister reported.

Permits spelling out license terms have been revised to allow exploration and production work.

Previous permitting systems required four separate licenses leading to production.

Royalties, income tax levels, and the government's participation in commercial discoveries will be determined prior to the signing of a license. The government will receive shares of production profits in the form of a noncontributing interest in licenses after operators of discoveries have established "acceptable rate of return, measured in real terms."

Initial license terms will be 3 years, with two automatic 2 year extensions, subject to completion by license-holders of work obligations under the previous period.

Development license terms will be 25 years.

PANAMA

AREA: 129,208 sq miles
POPULATION: 1,940,000
CAPITAL: Panama
MONETARY UNIT: Balboa

THE 80 MILE, 800,000 B/D Trans-Panama Pipeline System was completed in 1982.

The line runs from Puerto Armuelles on the Pacific Ocean to Chiriqui Grande on the Atlantic Ocean. Construction of the $250 million system began in summer 1981.

At yearend 1982, Louisiana Offshore Oil Port Inc. (LOOP) had received its first shipment of Alaskan North Slope crude via tanker and the trans-Panama line.

Coal plant. Ebasco Services Inc., New York, is organizing a venture to build a coal gasification/methanol complex at Chiriqui Grande that would use Midcontinent U.S. coal as feedstock.

The complex—proposed for start-up in 1990 at a cost of about $4.5 billion (1982 dollars)—would gasify 6.6 million tons/year of high sulfur coal. The gasified coal would be feedstock for production of about 4 million tons/year of methanol.

Ebasco has obtained a $500,000 grant from the U.S. Trade and Development Program to organize U.S. coal suppliers and U.S. and international technical groups, equipment suppliers, and investors to fund and implement a $10 million planning program for the complex.

What's involved. Ebasco hopes to develop methanol markets in Asia-Pacific, particularly Japan, South Korea, and Taiwan. Potential markets for by-products, such as liquefied synthetic gas, would be studied.

U.S. coal would be shipped via the Mississippi River for Louisiana transfer to Chriqui Grande, which is on the Caribbean side of Panama.

Methanol would be shipped through a dedicated pipeline across northern Panama to Puerto Armuelles on the Pacific side. The pipeline would use right-of-way established for the 80 mile trans-Panama crude oil pipeline.

An export terminal and storage facility would be built at Puerto Armuelles.

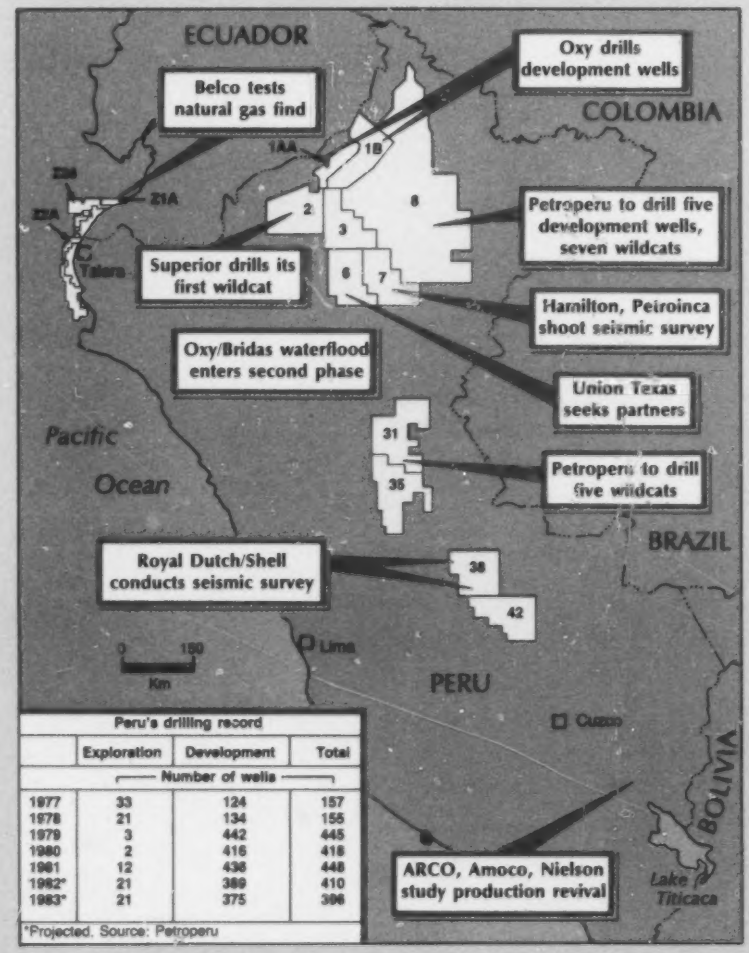
Rig code. Panama planned to adopt the International Maritime Organization's code for construction and equipment of mobile offshore drilling units.

IMO is the United Nation's maritime safety body, headquarterd in London. The code was adopted by IMO in 1979 and recommended for adoption by member countries.

More than 150 mobile drilling units—about 25% of the world fleet—are registered in Panama. Panama would be among the first IMO member countries to give the code effect.

The code's purpose is to provide an international standard for newly constructed drilling units, promote personnel safety, and facilitate the international movement and operation of offshore rigs. Topics include design and stability, materials strength, machinery and electrical installations, fire safety, and life saving equipment.

A sample of 1982 happenings in Peru



Peru's drilling record

	Exploration	Development	Total
	Number of wells		
1977	33	124	157
1978	21	134	155
1979	3	442	445
1980	2	416	418
1981	12	436	448
1982*	21	389	410
1983*	21	375	396

*Projected. Source: Petroperu

IPE

PERU

AREA: 492,222 sq miles
POPULATION: 18,280,000
CAPITAL: Lima
MONETARY UNIT: Sol

DRILLING/PRODUCTION activity in Peru is beginning to regain some of the momentum lost when the jungle surge of the early 1970s ended.

Half a dozen firms were searching for oil and gas in Peru in late 1982, including Superior Oil Co., Royal Dutch/Shell Group, and Hamilton International Oil Co. State owned Petroleos del Peru (Petroperu) is stepping up its drilling program. And World Bank loaned Petroperu $81.2 million for a project designed to boost production from oil fields on the country's northwest coast.

Total industry spending in 1982 was expected to reach $520 million, compared with $498 million in 1981. Petro-

INDONESIA

AREA: 788,430 sq miles
POPULATION: 150,520,000
CAPITAL: Jakarta
MONETARY UNIT: Rupiah

EXPLORATION/DEVELOPMENT activity in Indonesia is picking up speed.

The outlook is for the high level of action in Indonesia to continue for most operators during the next few years if the government doesn't cut incentives in its petroleum laws.

Activity among a few major international companies may plateau during the next 12-18 months as those firms tighten the reins on their world exploration/developments. But after that, Indonesian exploration/development by major firms will increase.

Hottest areas off Indonesia in 1982 were the Java Sea, South China Sea, and off Kalimantan. Onshore exploration/development centers on Sumatra and Kalimantan.

A record 323 wildcats were planned in 1982. That would break the previous record of 261 set in 1981.

State owned Pertamina planned to drill 21 wells in 1982, up 12 from 1981. The rest were to be drilled by foreign operators under production sharing contracts or contracts of work.

Total 1982 capital spending by foreign operators and Pertamina is estimated at $4.2 billion, up from $3.1 billion in 1981. About $1.1 billion of this year's outlay will go for exploration, up 12.7% from 1981, the U.S. embassy reports.

A stable government, reasonable contract terms, and good relations between operators and Pertamina add up to an attractive investment atmosphere.

Other lures include recent promising discoveries, good prospects in many underexplored areas onshore and offshore, and favorable drilling conditions that include shallow water and mild weather.

Producers also are attracted to Indonesia by an expected surge in domestic oil demand, which by some estimates will increase at least 10%/year through 1990. That compares with an outlook for continued slack demand in most parts of the world.

Indonesia's crude oil production was expected to reach 1.45 million b/d by yearened.

Natural gas production has been rising steadily during the past few years. In 1981, production amounted to 1.12 trillion cu ft, up from 1.04 trillion cu ft in 1980. Production in 1975 was only 222 billion cu ft.

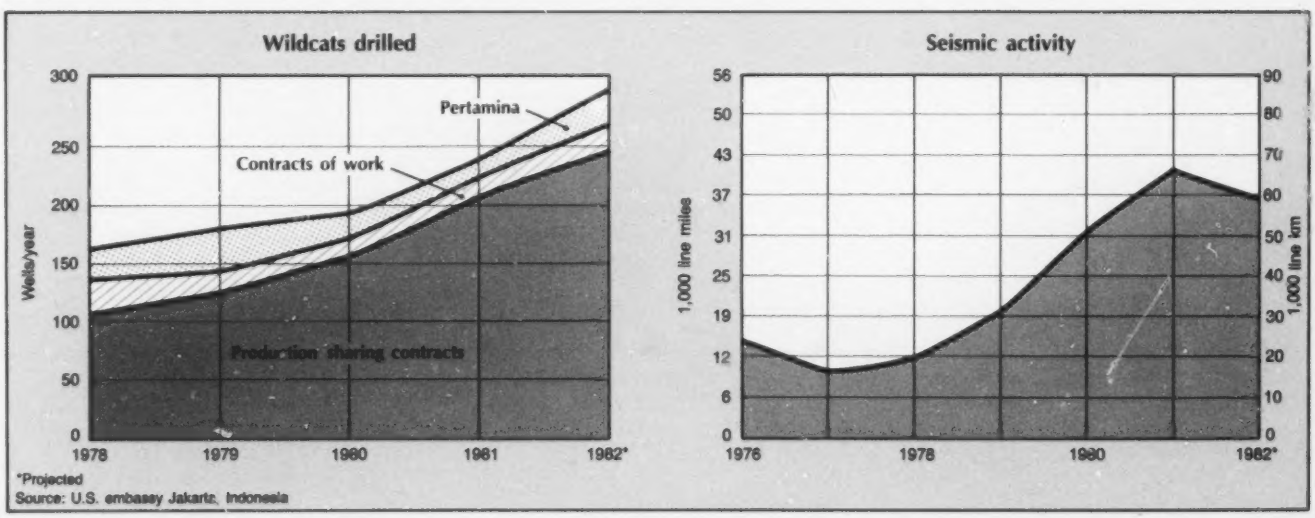
There are a number of obstacles to future growth in gas production, how-

Asia-Pacific area 1982 exploration activity, spending

Country	Rigs: Land	Rigs: Offshore	Rigs: Total	Expenditures (Million $)
Australia	30	8	38	940
Burma	4	1	5	120
Brunei	1	2	3	150
China	—	10	10	690
India	17	6	23	640
Indonesia	20	20	40	1,640
Japan	8	1	9	170
Malaysia	0	6	6	415
New Zealand	2	3	5	235
North Korea	0	1	1	70
Pakistan	6	1	7	145
Philippines	1	3	4	220
South Korea	0	1	1	70
Sri Lanka	0	2	2	140
Taiwan	6	1	7	145
Thailand	3	3	6	250
Total	**98**	**69**	**167**	**6,040**

Source: Gaffney, Cline & Associates Inc.

How Indonesian exploration effort has increased



*Projected
Source: U.S. embassy Jakarta, Indonesia

Offshore action around the world

1982 WILL PROBABLY BE REMEMBERED as the year the petroleum industry would most like to forget. The all-consuming economic downturn of energy activity hit hard and fast. The onshore sectors felt the first blows; but the offshore took some devastating punches, too.

Industry analysts and economic experts spent most of the year either charting the reasons for the recession or forecasting when it would end. Several explanations were offered for the dismal situation: the decline in domestic crude prices; unstable OPEC prices; the decline in deep gas demands; and the decline in drilling fund sales.

Some economists said the 1980-81 oil boom led to a natural overexpansion and overcapacity among drilling contractors and rig equipment manufacturers. And as drilling budgets and development plans shrivelled, so did equipment and rig utilization. The service and supply sectors of the industry sustained some irreparitable damages as well.

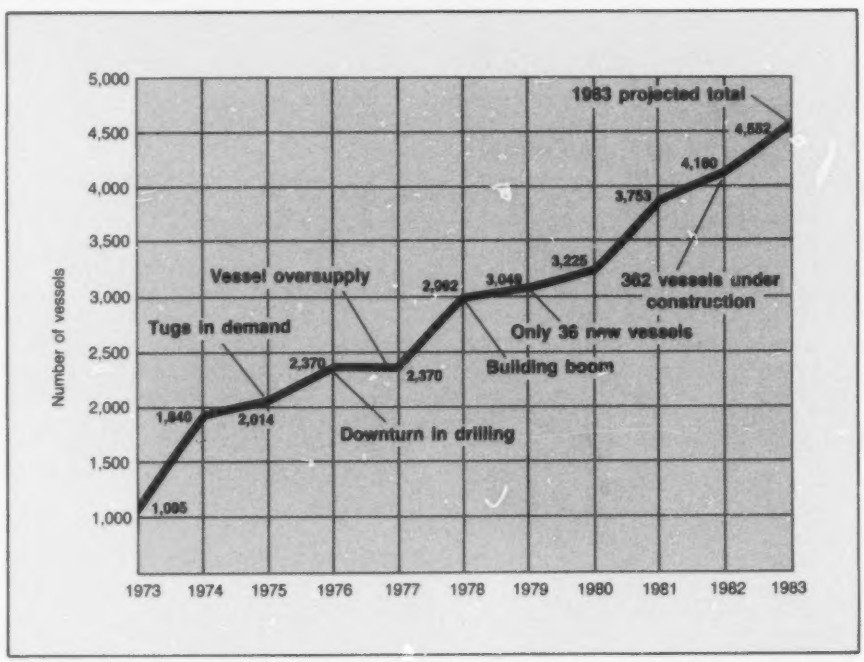
For the offshore, however, brighter days are predicted in sight. Some degree of recovery took place this year and 1984 offers much better prospects. Exploration and development projects in some parts of the world are gearing up and moving out, others nations are dusting off shelved plans for reconsideration.

Exploration budgets are also expected to be beefed up. Offshore targets of top priority will be the Bering Sea, South China Sea and Beaufort Sea. The Santa Maria Basin off southern California, Canada's Grand Banks and the Ivory Coast off West Africa should also experience heavier exploratory efforts in the coming drilling seasons.

To better appreciate the current state of the industry, here's a worldwide recap of the recent offshore events leading up to this point and the upcoming plans for recovery.

NORTH AMERICA RECAP. Independent oil companies may help to revive the lackluster exploration activity off the Gulf of Mexico this year thanks to the expected drops in day rates and drilling costs. Major drilling projects are also slated along the California and Alaska coastlines, especially off the Santa Maria basin and Beaufort Sea where reserves are believed to be huge.

Marine transportation fleet, 1973-83



The future along the eastern seaboard is uncertain, however, as the Mid-Atlantic dusters multiply and Canada continues playing political games.

Gulf of Mexico. Of all the drilling areas in the world, the Gulf of Mexico was hit the hardest by the 1982 economical downturn. The reason for this is that the Gulf is jackup territory, and the jackups market is still suffering from oversupply. Even with this recession, however, there are more rigs working in the Gulf than could ordinarily be expected.

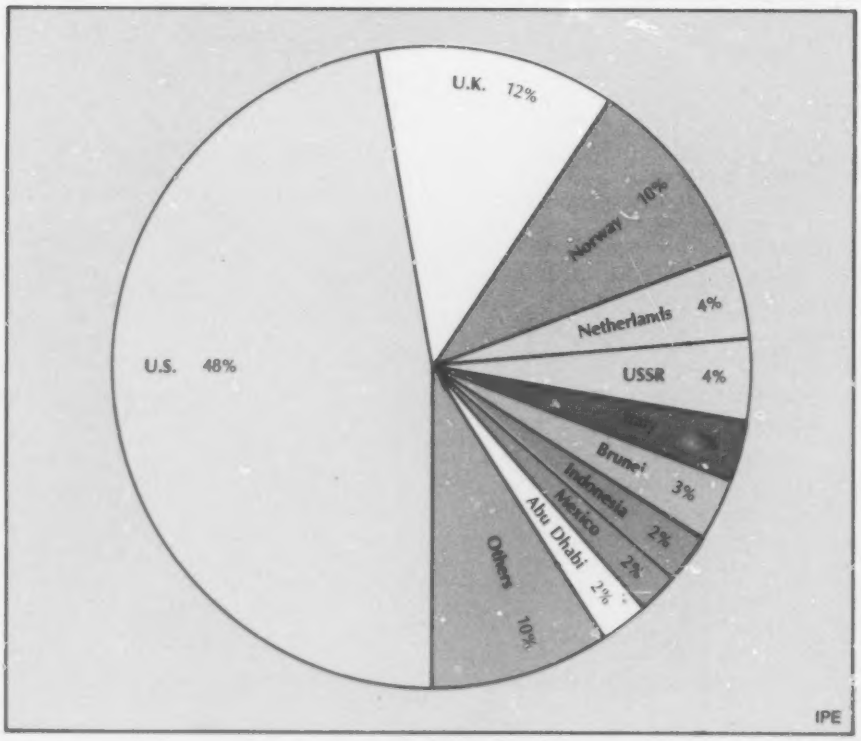
By any account, the Gulf of Mexico dominates offshore play. Almost six billion bbls of oil have been produced from the Gulf to date, and operators believe at least another 3 billion is yet to come. Nearly half of the offshore wells drilled around the world are in U.S. waters, and that usually means the Gulf of Mexico. Almost a quarter of the world's drilling fleet and possibly half of all supply boats can be found there.

Most operators in the Gulf of Mexico are marking time, waiting for predictability to return to crude oil pricing and gas regulation. Indications that cash-rich independents with access to drilling logs of long-time Gulf operators may be setting up plans for increased activity in 1983-84. With the shake-down in day rates and related offshore drilling costs, the effort to develop the smaller reservoirs sought by independents could produce some desired results.

One of the traditional advantages of working in the Gulf of Mexico is the substantial daily crude output rates achieved, making for speedy investment returns. On the other hand, reservoirs are drained quickly and the average life of a Gulf oil field is dropping rapidly. A field life for new crude reserves of less than five years is becoming more common.

Crude production in the U.S. Gulf Coast area is expected to drop precipitously in the 1983-86 period. Crude reserves discovered in the early 1970s

World offshore gas production



of the program to install desalting facilities.

Abu Dhabi. Although current development projects offshore Abu Dhabi will increase oil production capacity to as much as 1.5 million b/d, its allowable production levels on existing fields have again been drastically cut.

By last spring, Abu Dhabi's on-and-offshore production was cut from 1.06 million b/d to 865,000 b/d, compared to the sustainable capacity of 1.4 million. Most of the cut was absorbed by the offshore Lower Zakum field where output was slashed from 210,000 b/d to 50,000 b/d because associated gas from the field is not an essential component of the Emirates Das Island LNG and LPG plants. Offshore output is presently about 365,000 b/d.

The giant Upper Zakum field should add a significant boost since initial production is expected to reach 350,000 b/d, rising to a peak of 500,000 b/d. The $5 billion project comprises a central production platform and three satellite gathering and separation stations, together with a further 75 new wellhead platforms and 226 wells. In addition, Zadco has taken over 19 wells on 17 wellhead platforms previously installed by ADMA-OPCO, the field's discoverer.

In 1981 the Umm Sharif field averaged 227,000 b/d production. The field's output has since been cut back to 200,000 b/d against a sustainable capacity of 250,000 b/d. United Petroleum Development of Japan has a $300 million secondary recovery program under way on the Bunduq field which straddles the Abu Dhabi-Qatar median line. Bunduq has been shut-in since 1979, but on completion of 12 water-injection wells, production should rise to 25,000 b/d.

Total is also busy installing a 15-slot wellhead platform on the Abu al-Bukhoush field as a final stage of a program to maintain the field's plateau output level of 70,000 b/d.

Th most significant find last year was ADMA-OPCO's Umm al-Lulu. Drilled near the Umm al-Dalkh field, the well flowed a total of 24,000 b/d of 34° gravity crude from seven zones.

Dubai, Qatar. The Dubai Petroleum Company completed development drilling on the Southwest Fateh 2 platform which is producing 28,000 b/d of the 200,000 b/d field total. The $70-million gas compression platform has been installed on the Fateh field to house facilities for a new gas-lift system to attempt to maintain output at less than 150,000 b/d.

Qatar, on the other hand, only has sufficient oil reserves for about another 25 years of production at current levels. Consequently, future hope is tied to the enormous North Dome gas field where reserves are estimated to be as much as 300 trillion cu ft.

Development of the field for LNG production together with domestic consumption will cost about $6 billion. The project calls for a production level of 2 billion cu ft per day, of which 760 Mmcfd will be used locally.

Offshore production, which in 1981 accounted for 45% of total output, is from three field——Idd al Shargi, Maydan Mahzam and Bul Hanine. Potential maximum sustainable production from the fields is about 320,000 b/d and 200 Mmcfd.

Other Emirates. Most eyes in Sharjah are on Amoco's onshore Sajaa gas and condensate development which is expected to begin production at 25,000 b/d of condensate. Offshore, the only production is from the Mubarek field which is shared with Iran. Production has fallen to about 10,000 b/d from a peak of 40,000 b/d, but operator Crescent Petroleum is implementing a water and gas injection scheme.

Oil and gas in commercial quantities has not been found in any of the other small Emirates, but exploration work is under way offshore.

ASIA/PACIFIC RECAP. New discoveries and promising production projects have sparked a renewed enthusiasm for offshore activity along the nations making up Southeast Asia. Indonesia has upped its exploration budget significantly; Malaysia hopes to double its output by the end of the decade; Thailand is focusing on its gas potential; and development work off the Philippines is in full swing.

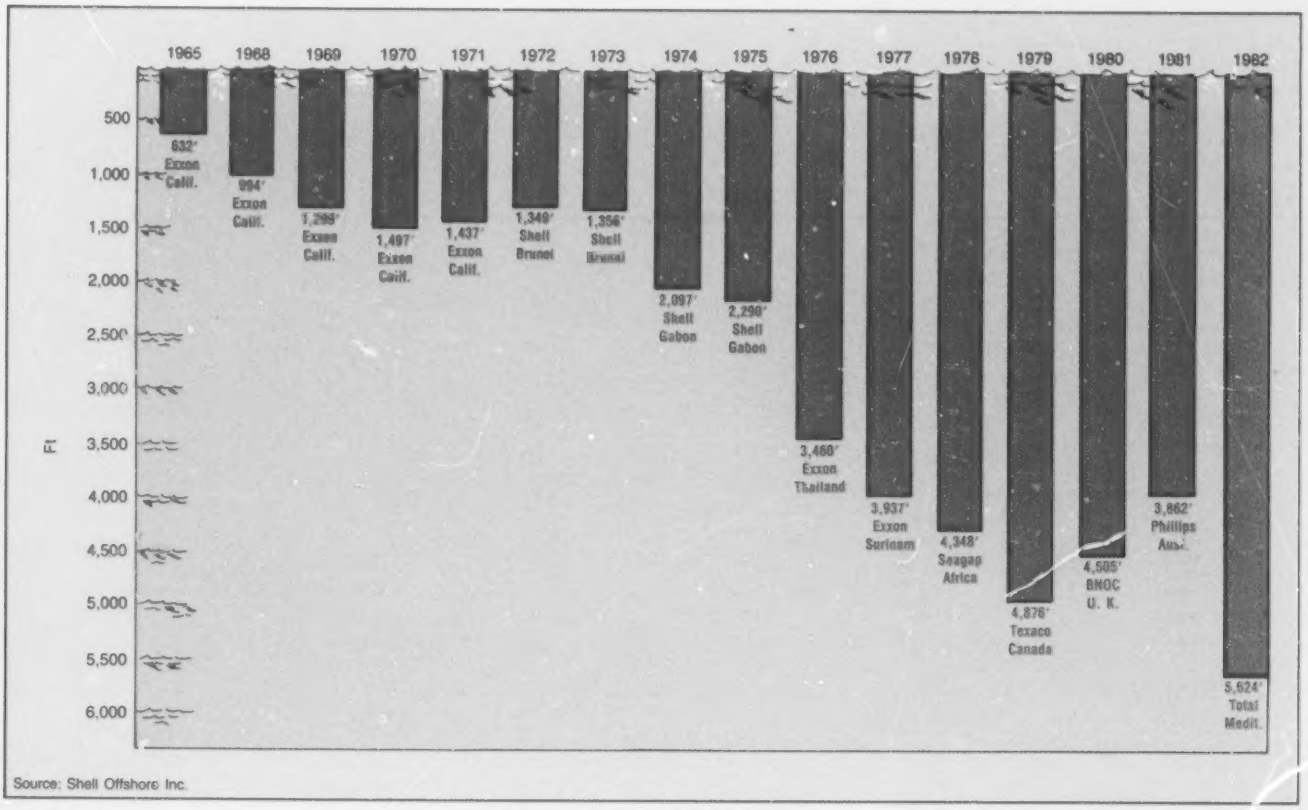
Indonesia. Still at the top of the list in Southeast Asia in terms of production and exploration activity is Indonesia where offshore growth is expected to continue. Evidence of this confidence was demonstrated last year when the government boosted its offshore oil and gas budget to $1.8 billion in its ongoing effort to attain a goal of 1.82 million b/d by 1983-84.

Indonesia also led their neighboring nations in drilling activity, most of which is centered arcund Southeast Sumatra where Natomas' Asian subsidiary liapco heads operations. The company expects to continue focusing on development work in this area and hopes to add about 50 million bbl to their reserves.

The discovery last year of the Sundari field brought the number of oil fields in the Natomas Southeast Sumatra territory to an even dozen. The field was confirmed by drilling two wells which testeo at rates of 973 b/d and 327 b/d from depths between 4,328-6,108 ft. The company's territory now extends 40 miles and includes 33 platforms and 175 wells producing at a total rate of over 100,000 b/d.

Other Sumatra activity reported by liapco last year included production start-up from their Zelda D platform at

Landmark water depths for worldwide drilling



Source: Shell Offshore Inc.

Drilling. A deepwater drilling slowdown, mostly resulting from crude price sluggishness, was evident in 1982.

About 23 holes were to have been drilled in deep water during the year, nine of them in 1,000 ft or more. That compares with 37 deepwater wildcats drilled in 1981, of which 22 were in depths exceeding 1,000 ft.

And the 1981 totals lagged those of the preceding year—65 deepwater holes, 40 of them in water deeper than 1,000 ft.

Activity has been spotty in water deeper than 2,000 ft. During 1974-81, 67 such holes were drilled worldwide. There were to have been 10-12 in 1981, compared with five in 1981, 19 in 1980, and 14 in 1979.

Meanwhile, the deepwater drilling fleet continues to grow. Deliveries of units capable of drilling in 600 ft of water or more continued through 1982, and more were planned through 1983.

At mid-1982 there were 179 drilling units capable of working in water deeper than 600 ft. Of that, 116 could drill at depths of 600-1,000 ft, 35 had maximum water depths of 1,000-1,500 ft, 11 had limits of 1,500-2,000 ft, and 17 had limits of 2,000-6,000 ft. Four rigs were capable of drilling in 6,000 ft of water.

The water depth record for drilling was set late in 1982 in the Golfe du Lion off France—5,624 ft. Sonat Offshore Drilling Co.'s Discoverer Seven Seas drillship drilled the hole for a partnership of Total Exploration, Elf Aquitaine, and Esso's French affiliate, spudding Nov. 10 and reaching a total depth of 11,830 ft in January 1983. Before that, the record was 4,786 ft, a Texaco Inc. hole off eastern Canada drilled by the Discoverer Seven Seas in 1979.

Technology advances. At the beginning of 1983, the technological limit of deepwater drilling was considered to be 8,000 ft of water, although it hadn't been tested.

It took these general technological advances to bring the offshore industry to that water depth capability level:

- Dynamic positioning. Use of computer controlled thrusters to keep a drillship or semisubmersible oriented above the well bore eliminates the need for anchors, which have physical water depth limits.
- Wellhead sonar reentry. Guidelines used for reentry in conventional water depths can barely support themselves, let alone riser and blowout preventer assemblies, in deep water. Replacing them in deep water are scanning sonars that locate wellhead funnels and guide the drilling unit until the BOP stack is properly positioned. Subsea televisions guide final alignment.
- Electric BOP controls. Electronic controls provide for fast closure of BOPs, improving the response capability of conventional controls.
- Special marine riser systems. By using tension and buoyancy, industry has been able to deal with the tremendous weights of deepwater risers.

Many industry officials believe the next technological step will be to extend water depth capability to 13,000 ft. Major problems in doing so will be marine risers, well control—which is critical because of formation fracture gradients—and circulation of kicks to surface.

Says Lloyd G. Otteman, president of Shell Offshore Inc., "The major engineering challenge of going into deeper water is the marine riser—a long pressure chamber extending from the sea floor wellhead connection to the drilling rig."

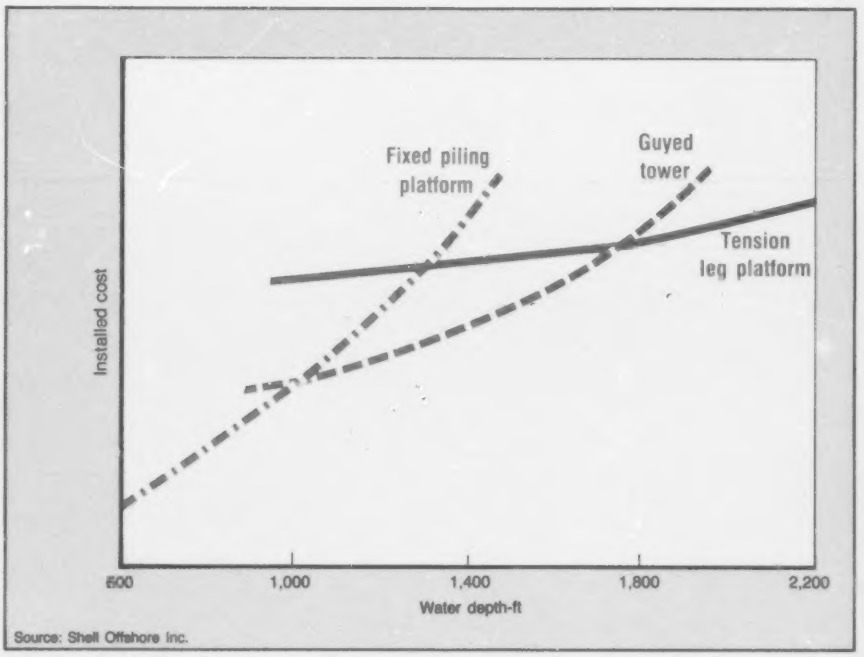
In September 1982 Carl L. Wickizer, manager, engineering, for Shell Offshore's Atlantic Coast Production Group, sized up drilling technology in an OCS lease sale public hearing. He said, "Existing drilling technology should be adequate for the next decade.

"Three of the four rigs with 6,000 ft water depth capability can be modified to drill in 8,000 ft. In fact, the engineering and equipment manufacturing to equip one such rig for 7,500 ft is currently in progress.

"Preliminary designs for new drilling rigs for 10,000 ft of water have been

RISER awaits transfer to central production platform in Garoupa field off Brazil, where a subsea production system was installed in 1978.

How platform water depth/cost projections compare



Source: Shell Offshore Inc.

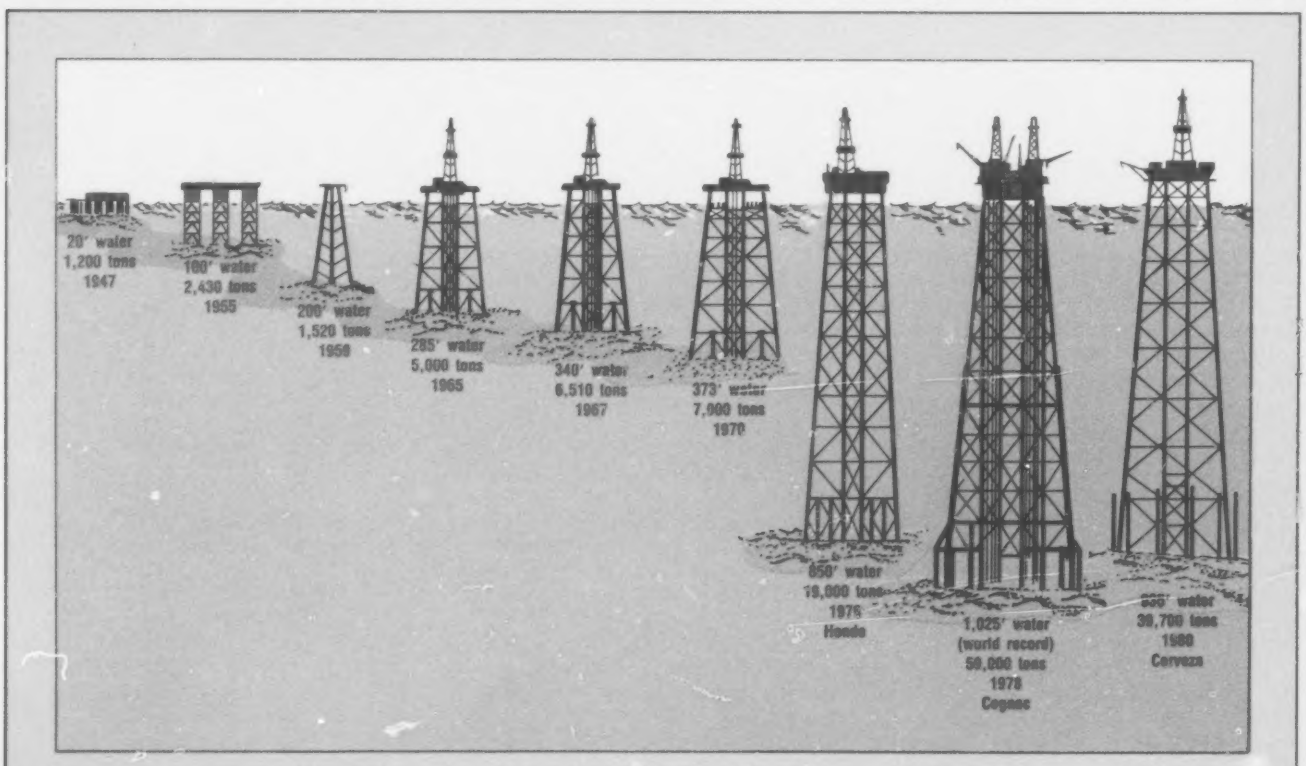
certain depths. The harmonics can amplify and tear apart the system.

Buoyancy is the key, Gulf says. Tethers, bearing as much as 2 million pounds of tension each, pull the buoyant hull down so the tethers neither slacken nor snap back up in maximum expected waves.

Advantages of the TLP, according to Gulf, include its ability to bring a field on production quickly. In addition, a TLP can be removed from a depleted field easily and at relatively low cost. Furthermore, a TLP can be reused.

But a TLP must be kept light, so

Platform construction milestones in U.S. waters



Source: Shell Offshore Inc.

Worldwide oil and gas at a glance

COUNTRY	ESTIMATED PROVED RESERVES 1-1-1983		OIL PRODUCTION			No. of ref.	REFINING Capacity (b/cd) January 1, 1983			
	Oil (1,000 bbl)	Gas (10^9 cu ft)	Producing wells** July 1, 82	Estimated 1982 (1,000 b/d)	% change from 1981		Crude	Thermal operations	Catalytic cracking	Catalytic reforming
ASIA-PACIFIC										
Australia	1,622,077	17,768	435	353.0	– 10.2	12	715,600	...	166,800	172,500
Bangladesh	...	7,000	...	...	...	1	31,200	...	...	1,720
Brunei	1,240,000	6,800	578	155.0	– 6.1	...	...	...	...	...
Burma	32,000	190	445	30.0	...	2	26,300	1,700	...	...
China, Taiwan	[c]6,700	560	65	3.0	...	2	515,410	3,933	9,040	52,440
Guam	...	...	...	...	...	1	43,700	...	...	...
India	3,416,400	14,508	1,560	384.0	+ 32.0	12	752,694	85,530	74,350	15,060
Indonesia	9,550,000	29,600	4,341	1,341.0	– 16.4	9	341,300	18,800	11,500	22,820
Japan	60,000	720	397	6.0	– 25.0	45	5,548,400	60,520	430,400	570,850
Korea, South	...	...	...	...	...	6	754,500	12,990	...	36,550
Malaysia	3,325,000	34,000	265	306.0	+ 15.9	3	175,000	...	...	10,300
New Zealand	[d]169,000	5,545	14	15.0	+ 50.0	1	74,000	...	...	24,000
Okinawa	...	...	...	...	...	3	183,000	...	...	11,600
Pakistan	196,300	18,540	32	12.0	+ 20.0	3	133,100	...	...	5,210
Philippines	35,600	16	6	7.0	+250.0	3	286,000	...	23,100	40,200
Singapore	...	...	...	...	...	5	1,096,000	105,000	....	39,000
Sri Lanka	...	...	...	...	...	1	50,000	12,500	...	3,750
Thailand	103,000	11,000	26	[e]6.0	...	3	176,000	12,000	8,800	25,100
Total Asia-Pacific	**19,756,077**	**146,247**	**8,184**	**2,618.0**	**– 5.8**	**112**	**10,902,204**	**312,973**	**723,990**	**1,031,100**
WESTERN EUROPE										
Austria	128,200	337	1,229	25.0	...	1	268,500	17,300	19,300	28,200
Belgium	...	...	...	...	...	5	692,600	51,600	90,900	92,400
Cyprus	...	...	...	...	...	1	15,500	...	...	3,000
Denmark	473,000	2,300	25	38.0	+153.3	3	215,000	74,575	...	37,900
Finland	...	...	...	...	...	2	299,000	45,500	37,500	48,000
France	124,300	2,700	432	33.0	– 2.9	20	2,871,000	114,600	244,500	387,000
Germany, West	310,000	6,319	3,077	84.0	– 1.2	27	2,471,300	330,600	177,900	388,550
Greece	59,780	3,500	11	21.0	+162.5	4	422,000	11,400	23,000	30,300
Ireland	...	...	...	...	...	1	56,000	...	...	14,500
Italy-Sicily	703,000	4,320	125	28.0	– 24.3	28	3,283,407	240,730	259,200	348,300
Netherlands	294,000	51,920	533	28.0	+ 3.7	7	1,551,500	170,900	111,000	187,900
Norway	6,800,000	58,000	131	488.0	– 2.6	4	242,700	67,000	...	29,000
Portugal	...	...	...	...	...	2	364,882	...	...	54,047
Spain	131,400	1,940	36	30.0	+ 25.0	10	1,522,000	64,400	25,000	195,700
Sweden	...	...	...	...	...	6	452,800	71,000	...	80,900
Switzerland	...	...	...	...	...	2	137,300	24,000	...	25,000
United Kingdom	13,900,000	25,400	379	2,050.0	+ 13.2	16	2,259,500	200,950	267,250	399,150
Total Western Europe	**22,923,680**	**156,736**	**5,978**	**2,825.0**	**+ 10.0**	**139**	**17,124,989**	**1,484,555**	**1,255,550**	**2,349,847**
MIDDLE EAST										
Abu Dhabi	30,510,000	19,260	352	883.0	– 22.8	2	135,000	...	...	21,950
Bahrain	197,000	7,890	243	45.0	+ 2.3	1	250,000	19,000	34,200	17,100
Divided (Neutral) Zone	5,840,000	8,380	445	315.0	– 15.1	...	...	...	...	...
Dubai	1,440,000	4,320	141	357.0	– 0.6	...	...	...	...	...
Iran	55,308,000	482,600	530	1,896.0	+ 42.3	4	530,000	80,800	...	63,845
Iraq	41,000,000	28,800	280	914.0	– 0.3	7	168,500	...	...	5,000
Israel	893	85	31	0.3	...	2	190,000	48,000	15,000	24,300
Jordan	...	...	...	...	...	1	100,000	....	4,410	8,640
Kuwait	64,230,000	29,900	530	675.0	– 28.1	5	623,000	...	...	47,120
Lebanon	...	...	...	...	...	2	52,000	...	7,250	7,292
Oman	2,730,000	2,690	416	328.0	+ 2.8	1	45,690	...	...	9,178
Qatar	3,425,000	62,000	125	340.0	– 16.0	1	11,753	...	...	1,650
Saudi Arabia	162,400,000	117,000	553	6,484.0	– 32.7	3	705,000	...	...	...
Sharjah	404,000	5,000	4	7.0	– 30.0	...	...	...	...	...
South Yemen (Aden)	...	...	...	...	...	1	178,000	...	...	12,000
Syria	1,521,000	1,260	601	175.0	+ 4.8	2	228,790	41,199	...	19,348
Turkey	280,000	545	366	45.0	– 4.3	4	467,400	...	41,260	43,875
Total Middle East	**369,285,893**	**769,730**	**4,639**	**12,464.3**	**– 20.6**	**36**	**3,685,333**	**188,999**	**102,120**	**281,298**

EDITOR'S NOTE: All reserves figures except those for the U.S.S.R. (and gas for Canada) are reported as proved reserves recoverable with present technology and prices. U.S.S.R. figures are "explored reserves" which include proved, probable, and some possible. Canadian gas figure, under criteria adopted by Canadian Petroleum Association in 1980, includes proved and some probable. [c]Condensate. *U.S. reserves numbers based on Energy Information Administration estimates which ran some 3 billion bbl and 11 trillion cu ft higher than API/AGA estimates for 1979, the last year the latter two associations provided estimates. †Estimates based on capacity as of Jan. 1, 1982, plus known 1982 closures and expansions. §Reported in bbl/stream day in 1981 report. ††Includes Albania, Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, North Korea, Poland, Rumania, Viet Nam, and Yugoslavia. **Does not include shut in, injection, or service wells.

COUNTRY	ESTIMATED PROVED RESERVES 1-1-1983		OIL PRODUCTION			No. of ref.	REFINING Capacity (b/cd) January 1, 1983			
	Oil (1,000 bbl)	Gas (10^9 cu ft)	Producing wells** July 1, 82	Estimated 1982 (1,000 b/d)	% change from 1981		Crude	Thermal operations	Catalytic cracking	Catalytic reforming
AFRICA										
Algeria	9,440,000	111,250	1,085	750.0	− 7.6	4	137,400	...	...	23,600
Angola-Cabinda	1,635,000	1,470	205	122.0	− 6.2	1	32,100	...	...	1,900
Cameroon	530,000	4,450	95	109.0	+ 23.9	1	43,000	...	...	6,500
Congo Republic	1,550,000	2,700	179	87.0	+ 10.1	...	...	...	...	...
Egypt	3,325,000	7,180	411	667.0	+ 11.5	6	340,650	...	...	10,800
Ethiopia	...	...	...	...	...	1	14,430	...	...	1,890
Gabon	460,000	485	266	130.0	− 13.9	1	20,000	7,200	...	1,400
Ghana	5,400	...	4	1.5	− 14.7	1	26,600	...	...	6,175
Ivory Coast	110,500	3,040	16	9.0	+ 80.0	2	90,075	...	...	14,600
Kenya	...	...	...	...	...	1	79,000	...	...	8,500
Liberia	...	...	...	...	...	1	15,000	...	...	2,000
Libya	21,500,000	21,500	891	1,127.0	+ 2.1	2	129,500	...	...	14,500
Madagascar	...	...	...	...	...	1	16,350	...	...	2,600
Morocco	290	...	NA	0.2	...	2	74,000	...	....	8,623
Mozambique	...	...	...	...	...	1	16,000	...	...	...
Nigeria	16,750,000	32,400	1,312	1,324.0	− 7.6	3	260,000	...	47,000	23,500
Senegal	...	...	...	...	...	1	18,000	...	...	1,900
Sierra Leone	...	...	...	...	...	1	10,000	...	...	...
South Africa	116,500	400	...	...	...	4	423,500	66,750	82,500	62,000
Sudan	400,000	...	...	...	...	1	24,000	...	...	2,100
Tanzania	...	200	...	...	...	1	17,000	...	...	4,200
Togo	...	...	...	...	...	1	20,000	...	...	4,400
Tunisia	1,860,000	4,300	91	106.0	− 10.2	1	34,000	...	...	3,300
Zaire	139,000	48	10	22.0	+ 10.0	1	17,000	...	...	3,500
Zambia	...	...	...	...	...	1	24,500	...	...	5,600
Total Africa	**57,821,690**	**189,423**	**4,565**	**4,454.7**	**− 1.9**	**40**	**1,882,105**	**73,950**	**129,500**	**213,588**
WESTERN HEMISPHERE										
Antigua	...	...	...	...	...	1	17,500	...	...	3,000
Argentina	2,590,000	25,200	6,822	483.0	− 2.6	12	675,700	54,600	98,500	37,700
Bahamas	...	...	...	...	...	1	500,000	...	...	...
Barbados	730	1	35	0.6	− 14.3	1	3,000	...	...	...
Bolivia	180,000	5,700	300	24.0	− 4.0	3	60,700	...	...	12,900
Brazil	1,750,000	2,330	2,115	252.0	+ 17.2	13	1,219,000	15,600	277,000	21,600
Chile	760,000	2,515	266	41.0	+ 2.5	2	141,000	8,400	34,000	9,300
Colombia	536,000	4,580	2,123	140.0	+ 12.0	5	213,500	41,000	77,000	6,000
Costa Rica	...	...	...	...	...	1	15,700	...	...	1,500
Dominican Republic	...	...	...	...	...	2	48,000	...	...	8,300
Ecuador	1,400,000	4,100	887	215.0	+ 1.9	3	78,857	11,389	11,389	2,513
El Salvador	...	...	...	...	...	1	16,300	...	...	2,800
Guatemala	50,000	35	9	6.4	+ 28.0	1	16,000	...	...	3,000
Honduras	...	...	...	...	...	1	14,000	...	...	1,800
Jamaica	...	...	...	...	...	1	35,500	...	...	3,500
Martinique	...	...	...	...	...	1	11,000	...	...	2,500
Mexico	48,300,000	75,850	3,605	2,734.0	+ 16.3	9	1,289,000	123,000	298,000	163,800
Netherlands Antilles	...	...	...	...	...	2	782,000	295,000	42,000	15,000
Nicaragua	...	...	...	...	...	1	14,400	...	...	2,850
Panama	...	...	...	...	...	1	100,000	...	...	7,500
Paraguay	...	...	...	...	...	1	7,500	...	...	...
Peru	835,336	1,201	2,780	196.0	+ 2.1	5	168,459	...	37,290	1,640
Puerto Rico	...	...	...	...	...	2	123,000	....	12,000	6,000
Trinidad & Tobago	580,000	11,000	3,142	182.0	− 24.2	2	375,000	...	25,000	27,000
Uruguay	...	...	...	...	...	1	45,000	5,000	...	3,000
Venezuela	21,500,000	54,079	14,029	1,826.0	− 13.4	7	1,283,700	82,000	177,900	7,500
Virgin Islands	...	...	...	...	...	1	600,000	40,000	...	125,000
United States	*29,785,000	*204,000	608,900	8,655.0	+ 1.0	240	†16,800,000	§†1,520,000	§†4,860,000	§†3,545,000
Canada	7,020,000	97,000	33,907	1,233.0	− 4.0	34	†2,020,000	§†45,000	§†440,000	§†375,600
Total Western Hemisphere	**115,287,066**	**487,591**	**678,920**	**15,990.0**	**+ 1.0**	**355**	**26,673,816**	**2,240,989**	**6,390,079**	**4,396,303**
Total Non-Communist	**585,074,406**	**1,749,727**	**702,286**	**38,352.0**	**− 7.4**	**682**	**60,268,447**	**4,301,466**	**8,601,239**	**8,272,136**
COMMUNIST AREAS										
China	19,485,000	29,800	NA	2,020.0	− 0.2	20	2,000,000	NA	NA	NA
U.S.S.R.	53,000,000	1,240,000	NA	12,200.0	+ 0.2	37	11,750,000	NA	NA	NA
Other††	2,630,000	14,000	NA	430.0	+ 0.0	45	3,123,000	NA	NA	NA
Total Communist	**85,115,000**	**1,283,800**	**NA**	**14,650.0**	**+ 0.1**	**102**	**16,873,000**	**NA**	**NA**	**NA**
TOTAL WORLD 1982	**670,189,406**	**3,023,527**	**NA**	**53,002.0**	**− 5.4**	**784**	**77,141,447**	...	...	...

Worldwide Production

• Offshore (e) Estimated (c) Condensate (NA) Not available

WORLDWIDE PRODUCTION		Name of field, discovery date	Depth, feet	No. of wells: Flow	Artificial lift	Shut-in	B/d average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
ABU DHABI	AMERADA GROUP	• Arzanah, 1973	10,750	9	...	1	10,000	°5,432,976	41.0-44.0
	CFP GROUP	• Abu Al Bukhoosh, 1972	6,400- 8,000	2	15	4	64,400	°196,000,000	34.0
		• Mubarras, 1969	8,950-10,700	6	15	2	19,000	°65,014,885	36.0
		• El Bunduq, 1965	8,300	...	...	15	...	°18,243,841	40.0
	ADNOC	Asab, 1965	7,500- 7,900	35	...	11	192,000	°1,016,358,160	41.0
		Bab, 1953	7,900- 9,900	26	...	29	†19,000	°686,157,689	44.0
		Bu-Hasa, 1962	7,500- 8,000	39	...	10	253,000	°2,277,624,599	40.0
		Sahil, 1967	8,560- 9,000	17	...	17	7,000	°50,628,416	41.0
		• Umm Shaif, 1958	8,500	52	...	8	209,000	°1,129,515,562	37.0
		• Upper Zakum, 1964	9,150	69	...	38	13,000	°155,985,590	39.0
		• Lower Zakum, 1964	9,100	69	...	38	128,000	°1,063,625,897	39.0
°Estimated. †Including condensate		**Total Abu Dhabi**		**326**	**26**	**171**	**914,400**	**°6,664,767,615**	
ALGERIA(e)	SONATRACH	Zarzaitine, 1957	4,700						42.2
		Edjeleh, 1956	1,500- 2,800						37.2
		Tiguentourine, 1966	2,160- 4,265						44.4
		El Adeb Lareche, 1958	4,100						43.3
		Assakaifaf N. & S., 1958	2,800						42.7
		Tan Emellel N. & S., 1960	2,800- 4,500						42.5
		Edeyen, 1964	5,580						41.5
		Hassi Mazoula S., 1963	4,430						40.2
		Hassi Mazoula B., 1965	4,920						42.0
		Acheb W. & Kreb, 1963 & 1960	7,360						45.6
		Tin Fouye N. +F6, 1962	4,265						39.6
		El Borma, 1967	8,200						42.9
		Keskassa, 1968	8,860						42.9
		Mereksen, 1974	9,420						45.8
		Gara, 1962	9,420						42.9
		Hassi Messaoud N., 1956	10,500						45.9
		Hassi Messaoud S., 1956	10,500						46.1
		Gassi-Touil & Gassi-Touil E., 1961	6,890						50.6-50.8
		Hassi Chergui	8,200						50.6
		Nezla N., 1965	8,530						51.5
		Rhourde El Baguel, 1962	9,850						40.2
		Mesdar E. & W., 1972	11,155						40.3
		El Gassi-El Agreb, 1959	10,170	NA	NA	NA	800,000	6,231,913,000	47.9
		Rhourde Nouss & E., 1972	8,530						39.7
		Tin Foye Tabankort, 1966	4,600- 6,560						41.1-41.3
		Djoua W., 1967	5,580- 6,240						41.1
		Amassak, 1970	6,565						41.1
		Tamendjelt, 1970	5,585- 6,890						41.1
		Timedratine, 1964	8,155						42.7
		Ohanet N. & S., 1960	7,878						43.8
		Askarene, 1962	8,200						41.7
		Guelta, 1962	8,960						41.7
		Stah, 1971	9,515						45.8
		Ras Toumb, 1976	9,190						35.7
		Haoud Berkaoui-Ben Kahla, 1965	11,000						43.6
		Guellala-Guellala N.E., 1969	11,320						42.2-42.3
		N'Goussa, 1974	11,715						42.2
		Kef El Argoub, 1973	12,570						42.2
		Oued Noumer, 1969	8,860						48.3
		Djorf, 1974	9,025						48.3
		Djebel Onk, 1960	3,940						37.0
		Alrar FJT	...						...
		Hassi R'Mel(c)	...						...
		Gassi Touil(c)	...						...
		Other Crude	...						...
		Condensate	...						...
		Total Algeria		**NA**	**NA**	**NA**	**800,000**	**6,231,913,000**	
ANGOLA	PETRANGOL S.A.R.L.	Bento, 1972	7,500	1	1	1	446	4,217,000	26.0
		Ganda, 1975	5,010	1	...	...	814	2,041,000	36.1
		N'Z Kitona S & D, 1973	5,200- 5,670	5	...	1	5,301	8,002,000	30.4
		N'Z Pangala, 1973	4,997- 5,095	3	2	4	7,490	32,036,000	36.1
		N'Zombo, SW I, SW S, & SW S, 1973	5,245- 6,270	6	...	1	2,657	19,425,000	30.2-31.0
		Quenguela, N., 1968	4,900- 6,200	...	17	31	3,085	31,055,000	31.1
		Quinfuquena I & S, 1975	6,800- 7,050	8	...	3	4,975	13,848,000	31.4-32.0
		Quinguila, 1972	4,100	1	10	5	6,779	18,113,000	36.2
		Other	...	21	9	29	2,980	41,973,198	...

WORLDWIDE PRODUCTION		Name of field, discovery date	Depth, feet	Flow	No. of wells Artificial lift	Shut-in	B/d average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
	GULF CABINDA	• Erva, 1969	10,650	1	...	...	877	3,335,846	30.2
		• Kambala, 1971	11,100	2	...	...	3,247	4,635,835	32.8
		• Kungulo, 1976	3,900	5	...	3	4,725	10,493,955	32.2
		• Limba, 1969	2,900- 8,750	3	5	2	15,514	56,462,834	31.6
		• Livuite, 1979	8,200	1	...	2	82	247,031	31.7
		• Malongo, N., 1966	1,500- 8,500	7	41	9	20,066	179,587,486	29.6
		• Malongo, S., 1966	1,300- 1,600	2	23	5	9,037	55,052,270	25.1
		• Malongo, W., 1969	1,800- 6,900	6	13	23	22,827	194,845,355	22.5
	TEXACO	• Cuntala, 1978	7,000- 7,500	1	...	...	1,587	1,545,706	34.0
		• Essungo	6,500- 6,750	*10	...	...	9,696	2,995,784	34.0
*Eight wells dual completed, 2 single completions.		**Total Angola**		**84**	**121**	**119**	**122,185**	**679,912,300**	
ARGENTINA*(e)		Chubut, 1907	1,968- 9,186	6	1,557	180			21.1-26.8
		Jujuy, 1969	2,461-16,732	7	...	...			46.5-47.2
		La Pampa, 1968	3,609- 4,921	...	171	6			31.1-31.3
		Mendoza, 1932	2,178-16,778	14	842	74			23.7-32.1
		Neuquen, 1918	1,312-12,498	161	494	127	483,000	3,746,893,000	24.0-41.1
		Rio Negro, 1960	2,953- 7,546	43	949	61			22.5-41.1
		Salta, 1928	6,551-15,092	39	3	11			39.0-59.7
		Santa Cruz, 1946	1,468-17,060	157	2,220	207			21.1-30.4
		Tierra del Fuego, 1959	5,249- 7,824	70	89	45			43.4-46.0
		Other	...	...	...	...			...
*Total output by YPF and all contract producers by provinces		**Total Argentina**		**497**	**6,325**	**711**	**483,000**	**3,746,893,000**	
AUSTRALIA	ESSO-BHP	• Barracouta, 1968	4,550	2	...	...	1,724	18,821,541	62.8
		• Cobia, 1972	7,700	...	...	1	...	1,163,692	44.6
		• Halibut, 1967	7,700	18	...	1	103,046	536,659,296	43.3
		• Kingfish, 1967	7,500	13	9	20	98,381	798,122,952	46.9
		• Mackerel, 1969	7,700	17	...	1	119,417	142,053,797	45.6
		• Tuna, 1968	6,500	22	...	8	16,759	12,086,204	40.5
		• Snapper, 1968	4,350	7	...	...	1,459	322,596	47.0
		• Marlin, 1966	5,100	2	...	2	1,556	281,546	50.0
	INTERNATIONAL OIL	Alton, 1964	6,000	...	4	1	57	1,812,643	50.5
		Cabawin, 1961	5,800	1	...	...	18	35,575	51.0
		Moonie, 1961	5,800	...	22	...	771	20,353,309	40.5
		Bennett, 1965	5,330	...	1	...	5	89,745	45.0
	WAPET GROUP	Barrow Island, 1964	1,200- 6,700	8	304	95	20,687	184,180,000	36.0
	HARTOGEN GROUP	Kincora, 1980	5,000	3	2	4	109	25,080	NA
		Sandy Creek, 1982	4,997	...	...	1	*	...	NA
		Waratah, 1982	5,525	...	...	2	*	...	NA
*Not yet on production.		**Total Australia**		**93**	**342**	**136**	**363,989**	**1,716,007,976**	
AUSTRIA	OEMV	Hochleiten, 1974	3,100- 5,000	7	29	9	1,565	996,171	21.3
		Matzen, 1949	6,100	24	676	170	13,560	356,377,243	25.7
		Muehlberg, 1942	3,900- 5,500	1	49	6	493	37,406,902	35.0
		Piperbach, 1968	3,500	1	8	...	178	3,220,865	39.0
		Pirawarth, 1947	1,600- 6,500	1	58	10	1,294	10,092,807	28.4
		St. Ulrich, 1938	1,600- 4,300	2	132	60	961	39,921,580	33.0
		Schoenkirchen-Prottes Tief, 1962	7,800-10,100	1	2	17	167	54,671,714	31.1
		Other	...	5	103	15	1,256	34,850,659	...
	MOBIL	Voitsdorf, 1963	7,000	3	20	11	979	20,248,900	36.0
		Sattledt, 1971	5,700	...	11	2	570	3,855,900	37.0
		Kemating, 1979	6,100	...	5	1	1,247	1,335,600	34.0
		Gaiselberg, 1938	5,200	...	31	28	902	30,526,800	24.0
		Other	...	...	60	29	2,037	22,215,500	31.0
		Total Austria		**45**	**1,184**	**358**	**25,209**	**615,720,641**	
BAHRAIN(e)	BANOCO	Awali, 1932	1,850- 4,600	158	85	34	45,000	708,725,000	33.0
BARBADOS	MOBIL	Woodbourne, 1966	6,500	8	25	10	600	1,655,315	30.5
		Other	...	...	...	2	...	42,439	...
		Total Barbados		**8**	**25**	**12**	**600**	**1,697,754**	
BOLIVIA	YPFB	Caigua, 1973	3,280	6	...	...	57	6,171,000	45.0
		Camiri, 1927	3,936	11	49	...	810	47,363,000	55.0
		Cambeiti, 1976	5,400	3	3	...	78	739,000	48.0
		Carand, 1960	3,940	8	24	...	1,325	52,733,000	60.0
		Colpa, 1961	9,184	25	...	...	810	17,249,000	65.0
		Monteagudo, 1966	4,592	8	18	...	2,171	27,776,000	41.0
		La Pena, 1965	8,856	20	...	...	1,361	18,730,000	43.0
		Palmar, 1964	10,758	4	...	...	715	1,126,000	65.0
		Rio Grande, 1961	3,512	35	...	...	7,431	51,791,000	62.0
		Tatarenda,1962	2,296	2	9	...	258	7,000,000	51.0
		Espino, 1979	14,655	2	...	...	580	459,000	56.2
		Other	...	5	41	...	485	11,430,000	...
	OCCIDENTAL(c)	Tita, 1976	6,450	14	1	...	1,100	3,404,522	70.5
		Porvenir, 1978	9,600	5	...	...	5,112	1,309,856	69.5

WORLDWIDE PRODUCTION		Name of field, discovery date	Depth, feet	Flow	No. of wells Artificial lift	Shut-in	B/d average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
	TESORO[c]	La Vertiente, 1977	10,827	7	...	...	1,773	*1,350,693	48.7-64.1
*Includes 1,192,930 bbl of condensate and 157,763 bbl of crude oil.		**Total Bolivia**		**155**	**145**	**...**	**24,066**	**237,202,071**	
BRAZIL	PETROBRAS ALAGOAS	Furado, 1969	4,440- 5,500	6	29	13	2,154	8,815,483	35.0
		Pilar	NA	NA	NA	NA	473	92,850	NA
		Tabuleiro de Martins, 1957	NA	NA	NA	NA	855	2,353,339	27.0
		Other	...	NA	NA	NA	374	872,504	...
	BAHIA	Agua Grande, 1951	820- 4,265	27	78	56	8,511	260,272,256	40.0
		Aracas, 1965	3,280- 8,856	6	81	15	9,962	91,156,933	41.0
		Buracica, 1959	1,476- 1,840	...	138	8	10,138	120,008,348	35.0
		Faz. Imbe, 1964	2,130- 5,575	2	15	6	1,322	11,589,705	40.0
		Faz. Boa Esperanca, 1966	7,215- 8,036	...	6	4	1,864	13,113,430	39.0
		Faz. Pamelas, 1962	NA	NA	NA	NA	1,012	4,958,308	37.0
		Malombe, 1966	3,280	...	15	3	1,002	5,712,468	41.0
		Mata/Remanso, 1971	4,445- 4,560	12	41	24	2,210	14,418,226	35.0
		Miranga, 1965	3,280- 3,936	9	139	46	13,207	156,460,043	40.0
		Rio Dos Ovos, 1979	NA	NA	NA	NA	456	1,189,296	35.0
		Santana, 1962	NA	NA	NA	NA	497	4,886,245	37.0
		Sesmaria	NA	NA	NA	NA	670	514,123	NA
		Candeias, 1941	3,280- 7,415	...	138	8	3,426	71,966,417	30.0
		Cassarongongo, 1959	1,475- 4,755	...	15	11	988	12,357,131	32.0
		Dom Joao Terra, 1947	NA	NA	NA	NA	1,165	18,171,859	38.0
		Gomo, 1961	NA	NA	NA	NA	515	2,057,988	32.0
		Taquipe, 1958	3,115- 3,935	1	49	15	4,731	75,267,263	40.0
		• Candeias Mar	NA	NA	NA	NA	1,088	5,504,596	30.0
		• Dom Joao Mar, 1947	920	3	262	142	7,451	70,056,136	38.0
		• Ilheus, 1979	NA	NA	NA	NA	568	660,619	41.0
		Other	...	NA	NA	NA	3,431	16,882,949	...
	CEARA	Faz. Belem, 1980	NA	NA	NA	NA	462	125,041	NA
		• Curima, 1978	6,888	3	...	...	4,311	3,469,459	32.0
		• Xareu, 1977	5,717- 5,766	6	...	...	3,033	1,433,894	39.0
	ESPIRITO SANTO	Faz. Cedro, 1962	5,248	...	9	7	789	7,815,624	28.0
		Sao Mateus, 1969	NA	NA	NA	NA	793	818,921	27.0
		Lagoa Parda, 1977	5,576	14	...	...	9,970	6,728,109	30.0
		Rio Itaunas, 1977	NA	NA	NA	NA	1,002	726,372	28.0
		• Cacao, 1978	9,184	3	...	...	2,527	4,405,597	37.0
		Other	...	NA	NA	NA	989	987,519	...
	RIO DE JANEIRO	• Enchova, 1976	6,973- 7,885	4	...	...	7,351	14,804,029	23.0
		• Bonito, 1977	NA	NA	NA	NA	3,480	4,335,649	27.0
		• Garoupa, 1974	11,382	3	...	2	10,746	7,853,954	30.0
		• Namorado, 1975	10,083	4	...	...	17,492	13,847,092	28.0
		• Norte Garoupa, 1974	12,693	2	...	...	4,721	3,379,546	30.0
		• Pampo, 1977	6,215	2	...	...	5,403	3,322,240	27.0
		• S.A.G.	NA	NA	NA	NA	17,558	4,551,797	NA
		• Linguado, 1981	NA	NA	NA	NA	3,021	56,592	NA
		• Badejo, 1981	NA	NA	NA	NA	7,543	1,448,889	NA
		• Bicudo, 1982	NA	NA	NA	NA	9,456	1,711,482	NA
	RIO GRANDE DO NORTE	Alto do Rodrigues	NA	NA	NA	NA	454	99,448	...
		• Ubarana, 1973	7,216- 8,265	26	...	6	13,148	15,262,029	40.0
		• Aguilha, 1975	5,412	6	...	2	2,879	4,643,893	33.0
		Other	...	NA	NA	NA	181	66,037	...
	SERGIPE	Atalaia Sul	NA	NA	NA	NA	1,445	1,478,671	NA
		Carmopolis, 1963	2,460	1	391	76	21,518	113,910,113	24.0
		Riachueio, 1961	1,475	...	124	42	4,239	11,784,462	28.0
		Siririzinho, 1967	1,640	...	81	25	4,004	23,771,129	30.0
		• Caioba, 1969	6,232- 6,890	9	1	3	4,702	22,952,938	36.0
		• Camurim, 1970	6,232	21	3	1	2,665	6,961,499	25.0
		• Dourado, 1970	3,620- 3,635	4	...	...	904	2,693,850	36.0
		• Guaricema, 1968	3,335-4,430	11	5	4	3,908	25,331,581	41.0
		Other	...	NA	NA	NA	1,172	2,444,259	...
		Total Brazil		**185**	**1,620**	**519**	**249,936**	**1,283,070,500**	
BRUNEI	BRUNEI SHELL	• Ampa SW, 1963	7,068- 8,155		114	82	40,649	466,079,311	41.0
		• Champion, 1970	4,300		96	54	43,088	190,249,730	23.0
		• Fairley, 1969	10,740		39	5	16,625	84,038,269	40.0
		• Fairley-Baram, 1973	9,500		4	1	2,104	11,673,807	40.0
		• Magpie, 1975	NA		14	...	18,544	27,027,991	31.0
		Seria, 1928	NA		311	209	31,932	919,852,442	34.0
		Other	...		...	4	...	638,066	...
		Total Brunei			**578**	**355**	**152,942**	**1,699,559,616**	
BURMA[e]	MYANMA	Chauk-Lanywa, 1902	1,500- 4,000						36.0
		Mann, 1970	1,600- 7,000						37.5
		Myanaung, 1964	2,000- 4,000	170	275	...	30,000	433,430,000	40.5
		Prome, 1965	850- 5,000						36.0
		Yenangyaung, 1902	100- 6,700						36.0
		Total Burma		**170**	**275**	**...**	**30,000**	**433,430,000**	

WORLDWIDE PRODUCTION		Name of field, discovery date	Depth, feet	Flow	No. of wells Artificial lift	Shut-in	B/d average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
CAMEROON	ELF	• Betika, 1972	5,300	10	...	5	10,454	10,273,824	42.3
		• Ekoundou S., 1975	6,200	13	...	4	9,399	11,922,867	28.6
		• Kole, 1974	5,500	10	...	5	8,873	18,478,849	31.3
		• Kombo Centre, 1976	5,900	12	...	4	26,959	28,171,270	37.0
		• Kombo North, 1978	7,200	3	...	3	4,795	2,697,623	35.0
		• Ekoundou North Center, 1972	7,200	38	...	4	39,070	16,847,629	34.7
		• Boa, 1976	5,900	7	...	1	542	69,496	29.3
		• Bavo South, 1976	5,600	2	...	...	3,488	136,679	35.0
		Total Cameroon		**95**	**...**	**26**	**103,580**	**88,598,237**	

		Name of field, discovery date	Depth, feet	No. of wells capable of prod.	B/d average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
CANADA	ALBERTA	Acheson, 1950	3,390	123	11,000	96,000,000	38.0
		Bantry, 1940	2,574- 3,300	156	2,000	32,000,000	...
		Bellshill Lake, 1955	2,950	209	6,000	36,000,000	...
		Bonnie Glen, 1952	3,959- 5,779	157	61,000	395,000,000	34.0-44.0
		Carson Creek, N., 1958	8,787- 8,935	70	19,000	108,000,000	44.0
		Cessford, 1950	2,800- 3,028	240	4,000	25,000,000	...
		Clive, 1951	6,074- 6,208	132	6,000	43,000,000	...
		Countess, 1951	2,858- 4,272	118	6,000	35,000,000	...
		Fenn-Big Valley, 1950	3,900- 5,400	320	36,000	241,000,000	32.0
		Gilby, 1962	4,201- 7,000	126	3,000	44,000,000	...
		Golden Spike, 1949	3,570- 5,961	77	4,000	223,000,000	36.0
		Harmattan, E.	8,040- 8,558	89	5,000	62,000,000	...
		Harmattan-Elkton, 1955	8,796-10,757	66	5,000	54,000,000	...
		Innisfail, 1956	6,730- 8,440	77	5,000	67,000,000	...
		Joarcam, 1949	3,179	223	3,000	89,000,000	...
		Joffre, 1953	4,983- 6,779	139	3,000	75,000,000	...
		Judy Creek, 1951	8,307- 8,701	259	30,000	348,000,000	43.0
		Kaybob, 1957	4,870- 9,577	85	8,000	86,000,000	...
		Kaybob, S., 1958	5,600-10,042	103	10,000	69,000,000	...
		Leduc-Woodbend, 1947	3,062- 5,380	741	8,000	363,000,000	40.0
		Lloydminster, 1933	1,690- 1,945	690	6,000	39,000,000	...
		Medicine River, 1954	5,435- 7,600	242	8,000	54,000,000	...
		Mitsue, 1964	5,908	259	35,000	216,000,000	43.0
		Nipisi, 1965	5,648- 5,726	244	31,000	194,000,000	41.0
		Pembina, 1953	3,000- 6,133	3,485	73,000	1,027,000,000	32.0-37.0
		Provost, 1946	2,760- 2,898	768	8,000	49,000,000	...
		Rainbow, 1965	4,994- 6,160	172	59,000	390,000,000	38.0-42.0
		Rainbow, S., 1965	6,102- 6,400	38	6,000	58,000,000	...
		Red Earth, 1956	4,184- 4,878	148	4,000	32,000,000	...
		Redwater, 1948	2,012- 3,200	843	38,000	741,000,000	35.0
		Simonette, 1958	10,500	23	3,000	35,000,000	...
		Snipe Lake, 1962	8,500	94	4,000	35,000,000	...
		Sturgeon Lake, S., 1953	4,912- 8,471	141	13,000	110,000,000	37.0
		Sundre, 1954	8,700- 9,000	53	3,000	33,000,000	...
		Swan Hills, 1957	8,100	734	57,000	574,000,000	40.0
		Swan Hills, S., 1959	8,400	195	33,000	293,000,000	37.0
		Turner Valley, 1913	3,100- 9,150	162	3,000	133,000,000	39.0
		Utikuma Lake, 1963	5,624	93	8,000	34,000,000	...
		Virginia Hills, 1957	9,210	153	12,000	115,000,000	34.0
		Wainwright, 1925	1,903- 2,200	200	6,000	54,000,000	...
		Westerose, 1952	6,818	17	13,000	92,000,000	...
		Willisden Green, 1956	5,157	655	11,000	93,000,000	...
		Wizard Lake, 1951	4,044- 5,973	39	38,000	259,000,000	...
		Zama	3,702	193	6,000	67,000,000	33.0-37.0
		Other	...	7,235	281,886	1,155,000,000	...
	BRITISH COLUMBIA	Boundary Lake, 1957	3,418- 4,575	351	12,000	146,000,000	40.0
		Other	...	307	23,000	203,000,000	...
	MANITOBA	All fields	...	889	9,000	134,000,000	...
	SASKATCHEWAN	Steelman, 1950	4,600	667	6,000	232,000,000	27.0
		Weyburn, 1955	4,600	579	13,000	253,000,000	28.0
		Other	...	10,373	97,000	1,315,000,000	...
	ONTARIO	All fields	...	...	2,000	57,000,000	...
	NEW BRUNSWICK	All fields	...	...	...	797,000	...
	NORTHWEST TERRITORIES	All fields	...	55	3,000	25,000,000	...
		Total Canada		**33,907**	**1,159,886**	**11,738,797,000**	

WORLDWIDE PRODUCTION		Name of field, discovery date	Depth, feet	Flow	No. of wells Artificial lift	Shut-in	B/d average, first 6 mo. 1981	Cumulative, bbl, to July 1, 1981	°API gravity
CHILE	ENAP-MAINLAND	Canadon, 1962	6,090	11	3	50	404	13,862,823	38.4
		Daniel, 1960	5,806	20	3	99	588	33,910,962	25.4
		Daniel Este, 1961	5,523	16	1	44	1,258	25,931,471	25.0
		Dungenes, 1962	5,251	4	1	14	136	3,697,024	28.6
		Posesion, 1960	5,622	45	...	31	1,156	19,382,701	63.6
	TIERRA DEL FUEGO	Calafate, 1955	6,045	5	4	47	783	23,355,107	49.3
		Catalina Sur, 1961	5,779	9	5	29	255	6,174,667	44.0

WORLDWIDE PRODUCTION		Name of field, discovery date	Depth, feet	No. of wells Flow	Artificial lift	Shut-in	Bbl average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
		Cullen, 1954	5,730	18	12	75	885	39,763,558	41.8
		Tres Lagos, 1957	5,724	23	..	60	745	14,772,603	40.1
	STRAIT OF MAGELLAN	• Ostion, 1977	7,156	2	5	2	1,547	3,415,877	33.0
		• Posesion, 1977	6,727	11	6	1	2,380	1,806,587	34.5
		• Spiteful, 1977	6,298	14	32	12	23,343	18,661,653	34.5
		• Spiteful Norte, 1978	7,150	7	9	3	3,994	2,530,081	39.0
		Total Chile		**185**	**81**	**467**	**37,474**	**207,265,051**	
CHINA, (TAIWAN)	CHINESE PETROLEUM	Tiechengshan,[c] 1959	...	29	...	4	1,687	12,443,091	51.0
		Chingtsohu,[c] 1967	...	9	...	4	269	...	50.0
		Yunghoshan,[c] 1971	...	5	...	1	246	4,891,625	45.0
		Other	...	42	...	10	341	...	50.0
		Total China, Taiwan		**85**	**...**	**19**	**2,543**	**17,334,716**	
COLOMBIA	ECOPETROL[a]	Bonanza, 1964	4,000						30.0
		Boquete, 1961	8,000						43.0
		Burdine, 1974	11,000						26.3
		Cantagallo, 1941	6,800						19.7
		Casabe, 1941	3,800						20.7
		Dina, 1962	2,900						22.5
		Galan, 1945	3,200						19.0
		Infantas, 1918	3,200						25.8
		La Cira, 1925	3,250	117	1,680	35	102,622	1,851,044,089	24.0
		Lisama, 1957	9,500						31.0
		Llanito, 1960	7,300						21.0
		Loro, 1964	9,600						30.5
		Orito, 1963	6,600						39.7
		Payoa, 1962	8,000						36.7
		Provincia, 1962	8,000						33.0
		Pto. Colon, 1965	9,600						30.5
		Salina, 1971	2,500						24.0
		Tello, 1972	4,200						20.2
		Tibu, 1940	4,200						37.2
		Yarigui, 1954	6,800						19.5
		Other	...						...
	CHEVRON	Castilla, 1969	6,500	5	...	...	3,447	3,765,725	13.5
		Rio Zulia, 1961	5,700	1	16	2	3,517	123,686,991	41.0
	TEXACO	Velasquez, 1946	7,500	...	122	28	5,609	155,210,768	19.0-24.0
		Palagua, 1954	5,000	...	104	27	4,560	71,469,460	14.0-17.0
		Cocorna, 1963	2,100	...	44	2	3,116	6,758,308	12.0-13.0
		Tisquirama, 1963	8,000	..	6	...	515	3,770,221	16.0-28.0
		Ortega, 1950	7,000	...	6	...	437	11,291,989	26.0-29.0
		Teca, 1981	2,100	...	14	1	940	176,822	12.0-13.0
		Other	...	...	8	5	187	4,807,127	...
		Total Colombia		**123**	**2,000**	**100**	**125,000**	**2,233,981,500**	
CONGO	AGIP	• Loango, 1972	3,000	4	31	1	21,350	42,289,000	27.0
	ELF CONGO	• Emeraude, 1969	1,000	94	1	18	27,000	112,396,000	23.3
		Pointe Indienne, 1957	5,000	2	...	17	188	6,438,000	36.9
		• Likouala, 1972	4,000	25	6	3	18,815	14,415,000	33.2
		• Yanga, 1979	4,000	14	...	5	19,336	4,746,000	31.0
		• Mengo, 1979	6,500	2	...	9	164	111,000	33.4
		Total Congo		**141**	**38**	**53**	**86,853**	**180,395,000**	
DENMARK	DUC	• Dan, 1971	6,000- 6,400	9	...	9	5,600	20,070,000	30.4
		• Gorm, 1971	6,500- 7,000	16	...	...	19,000	6,810,000	35.0
		Total Denmark		**25**	**...**	**9**	**24,600**	**26,880,000**	
DIVIDED ZONE	AOC	• Khafji, 1961	4,400- 6,300	104	...	14	136,000	1,896,000,000	28.2
		• Hout,* 1969	5,300-10,500	46	...	23	22,000	225,000,000	33.0
	GETTY & KOC	Wafra, 1953	1,100- 7,000	3	271	141	85,246	1,156,791,979	18.9-23.5
		S. Fuwaris, 1963	6,300	...	6	3	2,070	18,641,179	25.0
		S. Umm Gudair, 1966	8,900	...	15	3	42,482	252,460,078	24.3
*Includes some Khafji Ratawi zone crude (30-32°) mixed in with Hout field crude.		**Total Divided Zone**		**153**	**292**	**184**	**287,798**	**3,548,893,236**	
DUBAI	DUPETCO	• Fateh, 1966	7,900- 9,000	59	25	5			31.8
		• S.W. Fateh, 1970	7,500- 9,000	33	14	9	364,000	1,226,852,000	30.3
		• Falah, 1972	8,100	8	...	...			25.5
		• Rashid, 1973	9,400-11,500	2	...	1			38.0
		Total Dubai		**102**	**39**	**15**	**364,000**	**1,226,852,000**	
ECUADOR	CEPE	Ancon,* 1921	4,000	3	503	..	1,105	115,163,000	35.6
		Shuara,* 1980	9,100	5	...	...	...	...	NA
		Secoya,* 1980	9,100	6	...	...	...	...	NA
		Shushuqui,* 1980	9,200	3	...	...	...	...	NA

WORLDWIDE PRODUCTION		Name of field, discovery date	Depth, feet	Flow	No. of wells Artificial lift	Shut-in	Bid average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
		Charapa,† 1967	10,000	...	4	...	...	...	NA
		Other	1,500- 2,000	28	145	...	293	4,837,000	...
	TEXACO	Aguarico, 1968	9,850	6	1	3	9,404	27,778,952	22.0
		Atacapi, 1968	9,850	4	...	1	4,189	5,439,273	31.0
		Auca, 1970 Auca Sur	10,300	4	16	4	16,670	33,483,402	28.0
		Lago Agrio, 1967	10,250	15	7	8	10,106	88,311,207	28.5
		Parahuacu, 1968	9,850	3	...	2	2,051	3,168,871	30.0
		Sacha, 1969	10,000	43	36	14	60,699	223,862,909	28.0
		Shushufindi, 1969	9,700	3	31	21	93,667	305,101,074	30.0
		Yuca, 1970 Yuca Sur	10,090	2	3	2	4,924	2,939,871	28.0
		Culebra, 1973	10,617	1	...	...	446	205,571	19.5
		Yulebra, 1980	10,345	1	...	...	511	218,462	19.0
	CITY EXPLORATION	Mariann, 1971	7,700	1	3	...	1,100	1,657,500	23.0
		Fanny,§ 1972	7,700	5	3	...	2,231	2,599,300	23.0
		Tarapoa, 1973	8,300	1	1	...	150	309,750	23.0
		Joan, 1974	7,500	...	...	2	...	5,000	18.0
		Total Ecuador		**134**	**753**	**57**	**207,546**	**815,081,1[illegible]2**	

*Started production August 1982. †Started production December 1982. §In unit with CEPE. City Exploration share is 65% or 1,450 b/d.

EGYPT	AMOCO	Abu Gharadig, 1972	9,500	10	6	5	5,168	22,753,396	36.0
		• El Morgan, 1965	5,100- 6,400	2	58	20	155,398	716,791,773	27.0-32.0
		• GS-382, 1977	10,500	3	...	...	9,832	20,485,542	33.0
		• July, 1973	8,100-10,000	5	15	5	97,617	294,739,456	31.0-34.6
		• Ramadan, 1974	11,300	6	10	4	90,000	230,761,181	31.7
		Razzak, 1972	7,700	1	7	8	5,827	43,149,300	36.0
		• SG-300, 1976	5,876	...	2	...	4,916	8,957,448	24.8
		• Shoab Ali, 1978	6,000	3	9	17	33,351	18,364,840	34.0
		• October, 1978	11,000	10	...	4	95,660	66,842,214	28.0
		• WD 33, 1972	9,800-10,800	...	1	...	192	1,601,164	32.0
		Other	...	...	...	...	...	1,585,538	...
	AGIP	Belayim, 1953	7,000- 8,500	4	82	7	35,400	337,344,000	22.0
		• Belayim Marine, 1961	8,500	2	28	1	91,000	328,464,000	30.5
	PHILLIPS GROUP	El Alamein, 1966	8,700	12	...	1	2,696	61,292,665	33.6
		Umbarka, 1976	10,700	4	...	...	1,267	2,717,815	43.9
		Yidma, 1971	9,000	4	...	1	3,205	17,951,442	44.0
	EGPC	Amer, 1965	3,500	1	12	12	1,953	9,624,922	21.5
		Asl, 1947	3,000	3	...	...	988	37,945,596	21.6
		Bakr, 1958	3,200	1	46	35	3,359	66,197,270	19.0
		El Ayoun, 1968	3,300	...	6	6	384	5,525,520	24.0
		El-Yusr, 1968	3,400- 3,900	3	21	15	4,057	27,398,482	21.0
		Gharib, 1938	2,200- 4,500	...	80	158	7,296	237,637,525	25.5
		Sudr, 1946	2,600	2	13	...	1,283	42,717,139	21.6
		Kareem	2,215- 2,310	...	9	26	516	10,316,662	16.6
		Shukheir	2,400- 2,500	5	...	4	580	1,946,762	34.0
		Other	2,000- 5,412	2	3	2	698	2,613,965	14.6-28.5
	CFP	Ras Shukheir, 1980	6,200- 6,300	1	...	2	1,020	692,000	40.0
		Total Egypt		**84**	**328**	**333**	**653,663**	**2,408,732,535**	
FRANCE	ALSACE	Pechelbronn,	1,020	...	3	1	22	4,022	37.2
		Other (abandoned)	...	...	...	...	...	26,370,806	...
	SOUTHEAST	All fields abandoned	...	...	...	...	...	222,679	...
	AQUITAINE BASIN	Cazaux, 1959	7,550	2	36	2	6,167	57,585,849	34.2-37.3
		Lavergne, 1962	11,480	...	4	...	688	11,268,428	41.7
		Lugos, 1956	5,250	1	20	2	2,385	7,785,190	20.8
		Lacq Superieur, 1949	2,170	10	29	10	932	23,584,292	22.3
		Montastruc, 1973	5,200	...	6	...	858	4,414,976	32.8
		Parentis, 1954	7,710	4	38	6	8,531	181,838,258	33.4
		Pecorade, 1974	10,660	5	...	6	2,292	4,051,527	29.3
		Castera-Lou,	9,600	...	5	1	670	875,920	27.1
		Vic Bilh	7,100	4	6	9	3,585	2,578,913	26.6
		Other	...	2	16	1	832	13,109,485	...
		Abandoned	...	...	...	...	...	70,857	...
	PARIS BASIN	Coulommes, 1958	6,230	...	31	14	473	12,339,106	32.6
		Saint-Martin, 1959	4,590	1	12	1	412	7,619,498	33.0
		Saint-Firmin, 1960	1,800	...	34	17	889	8,292,315	27.5
		Châteaurenard, 1958	1,800	...	24	9	445	5,344,800	27.5
		Chailly, 1958	5,580	...	20	10	214	8,730,136	35.4
		Chuelles, 1961	1,800	...	37	16	582	5,372,710	27.5
		Soudron, 1976	4,600	...	15	6	672	636,001	34.4
		Other	...	2	65	28	1,507	11,727,021	...
		Abandoned	...	...	...	...	...	239,850	...
		Total France		**31**	**401**	**139**	**32,156**	**354,062,639**	
GABON	ELF-GABON*	• Anguille, 1962	8,200	10	17	...	13,973	96,843,000	31.2
		• Anguille NE, 1968	7,500	3	7	...	2,753	39,819,000	31.0
		• Anguille NNE, 1971	7,500	...	...	...	656	6,607,000	31.4
		Batanga, 1960	6,000	1	...	...	244	7,708,000	43.0
		• Barbier, 1974	7,200	14	...	...	10,644	63,482,000	30.0
		• Breme, 1973	5,700	8	...	...	9,517	33,647,000	36.1
		Clairette, 1956	9,000	...	13	...	533	28,588,000	29.5

WORLDWIDE PRODUCTION		Name of field, discovery date	Depth, feet	No. of wells: Flow	No. of wells: Artificial lift	No. of wells: Shut-in	B/d average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
		• Doree, 1972	7,200	1	...	...	246	2,167,000	31.4
		• Girelle, 1973	12,000	3	...	...	4,069	19,483,000	31.1
		• Gonelle, 1972	7,200	2	8	...	3,539	13,395,000	24.8
		• Grondin, 1971	7,500	4	9	...	7,834	148,046,000	27.4
		Lopez Nord, 1961	5,600	1	2	...	183	18,638,000	23.4
		• Mandaros, 1972	6,500	9	7	...	13,648	50,937,000	31.0
		Olende, 1976	6,700	5	..	...	1,676	2,477,000	33.5
		• P.G.S. Marine, 1975	8,200	4	...	...	1,012	3,940,000	32.0
		• Port Gentil Ocean, 1964	7,500	1	4	...	1,427	18,300,000	32.9
		Tchengue, 1965	3,600	1	8	...	1,189	27,856,000	27.2
		• Tchengue Ocean, 1963	6,500	3	1	...	323	7,685,000	31.2
		• Torpille, 1961	9,800	13	1	...	6,664	57,902,000	36.4
		• Baliste, 1974	6,600	6	...	...	2,382	1,521,000	27.6
		• M'Bya, 1969	6,700	7	6	...	4,887	1,806,000	35.6
		M'Polunie, 1980	2,200	1	1	...	357	273,000	24.4
		M'Boumba, 1978	3,700	3	1	...	670	518,000	26.4
		• Anguille SE, 1962	9,800	4	...	...	1,153	209,000	33.05
		• Ayol Marine, 1979	9,200	7	...	..	2,527	457,000	21.4
		• Baudroie Nord, 1980	9,000	2	...	...	2,604	471,000	34.5
		Other	...	...	...	...	...	25,966,000	...
	SHELL-GULF-ELF*	• Lucina-Marine, 1971	5,900	12	1	...	12,670	25,060,821	37.0
	SHELL-ELF*	Gamba, 1963	3,000	30	...	19	10,783	140,372,234	32.4
		Ivinga, 1967	3,100	25	...	5	8,114	84,476,924	32.5
*Cumulative estimated		**Total Gabon**		**180**	**86**	**24**	**126,277**	**928,650,979**	
GHANA	AGRI-PETCO	• Saltpond, 1977	8,500	4	...	2	1,450	2,311,013	36.0-39.0
		Total Ghana		**4**	**...**	**2**	**1,450**	**2,311,013**	
GREECE	N. AEGEAN PET. CO.	• Prinos, 1974	8,000- 8,800	11	...	...	20,917	5,272,000	27.8
GUATEMALA	PETRO-MAYO S.A.	Rubelsanto, 1974	5,300- 7,000	3	2	...	1,500	1,187,905	26.0-30.0
		West Chinaja, 1977	3,200- 3,800	3	...	...	4,000	2,843,136	35.0-43.0
		Caribe,* 1981	NA	1	..	...	900	146,028	22.0-24.0
*Placed on production in February 1982.		**Total Guatemala**		**7**	**2**	**...**	**6,400**	**4,177,069**	
INDIA	GUJARAT STATE	Ankleshwar, 1960	2,953- 3,937	NA	NA	NA			
		Bakrol, 1968	4,593- 4,921	NA	NA	NA			
		Kadi, N., 1968	2,953- 3,909	NA	NA	NA			
		Kadi, S., 1968	5,906- 6,562	NA	NA	NA			
		Kalol, 1961	4,265- 5,250	NA	NA	NA			
		Kathana, 1965	5,250- 5,906	NA	NA	NA			
		Kholka, 1966	4,265- 5,577	NA	NA	NA			
		Kosamba, 1963	1,968- 2,625	NA	NA	NA	382,520	1,187,710,000	14.0-44.0
		Nawagam, 1963	4,429- 6,652	NA	NA	NA			
		Sanand, 1963	4,265- 4,593	NA	NA	NA			
		Sobhasen, 1968	4,429- 5,906	NA	NA	NA			
		Wovel, 1963	4,265- 4,593	NA	NA	NA			
	ASSAM STATE	Digboi, 1890	300- 7,500	NA	NA	NA			
		Geleki, 1968	12,632-12,795	NA	NA	NA			
		Lakwa, 1965	8,038-12,795	NA	NA	NA			
		Moran, 1958	11,000	NA	NA	NA			
		Nahorkatiya, 1953	9,500	NA	NA	NA			
		Rudrasagar, 1961	10,171-10,500	NA	NA	NA			
	MAHARASHTRA STATE	• Bombay High, 1974	4,530- 4,630	NA	NA	NA			
		Total India		**NA**	**NA**	**NA**	**382,520**	**1,187,710,000**	
INDONESIA	PERTAMINA UEP I	Arubai,	...	...	...	92	...	25,559	...
		Batumandi, 1974	8,120	..	...	3	...	113,472	37.7
		Besitang, 1977	3,973	8	...	4	1,323	1,184,436	51.5
		Gebang, 1977	2,917	10	22	17	1,427	4,390,157	54.0
		K. Simpang, 1971	3,740- 5,019	19	6	21	6,200	6,363,875	45.0
		P. Tabuhan, 1937	3,350- 5,893	26	..	81	1,722	22,322,002	50.8
		Rantau, 1929	2,764	11	128	...	5,474	226,488,406	45.3
		Serang Jaya, 1926	3,701	24	..	55	526	2,441,773	47.5
		Other	...	4	2	159	250	14,648,082	...
	PERTAMINA UEP II	Benuang, 1942	6,103	21	...	4	1,567	2,019,755	35.1
		Benakat East, 1973	NA	7	26	10	2,470	12,823,845	NA
		Tempino, 1931	1,647	2	49	111	1,248	83,496,850	23.0
		Gn. Kemala, 1938	5,448	8	2	34	538	23,871,345	38.0
		Limau, 1928	3,896- 4,626	1	4	31	2,455	175,558,262	NA
		Ogan Timur, 1943	3,793	4	2	4	991	2,407,629	27.42
		Talang Jimar, 1937	4,123	1	50	148	4,649	167,305,761	31.0
		T. Miring, 1935	640	14	2	8	2,905	5,865,364	NA
		Tanjung Tiga, 1938	3,750	1	43	49	2,595	53,551,552	28.0
		Kenali Asam, 1931	2,077	1	54	173	1,209	12,128,892	29.0
		Other	...	14	36	268	1,878	604,256,470	...
	PERTAMINA UEP III	Cemara, 1976	3,964- 7,104	4	3	18	2,483	1,158,367	...

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	Flow	No. of wells Artificial lift	Shut-in	B/d average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
	Jatibarang, 1969	3,063	28	50	34	16,548	7,967,051	29.0
	Tugu Barat, 1979	3,014	6	...	5	787	392,184	...
	Other	...	11	2	13	386	120,234	...
PERTAMINA UEP IV	Bunyu, 1923	2,077	17	34	30	3,633	74,526,772	33.2
	Sangatta, 1939	1,842	21	24	36	4,397	12,735,964	33.0
	Kambitin	3,491	...	...	3	92	32,613	...
	Tanjung, 1938	2,296	3	63	20	3,625	97,259,611	39.9
	Tapian Timur, 1967	4,396	10	...	4	2,449	1,796,549	38.8
	Warukin S., 1966	2,067	...	8	5	680	9,212,947	26.9
PERTAMINA UEP V	Klamono, 1936	574	...	33	2	973		19.0
	Linda, 1977	3,281	NA	NA	NA	130	1,626,465,779	19.0
	Sele, 1951	2,156	NA	NA	NA	495		35.0
CALTEX	Aman, 1974	4,700	...	10	...	3,872		34.7
	Antara, 1978	1,425	...	5	...	1,213		36.0
	Balam, 1969	1,600- 4,500	...	52	...	15,611		30.1-33.4
	Bangko, 1970	1,950	...	60	9	26,304		34.2
	Batang, 1975	690	...	11	1	1,170		20.4
	Bekasap, 1955	2,950- 3,900	...	57	3	15,485		33.5-34.0
	Benar, 1973	2,450	...	25	...	7,892		33.2
	Intan,1977	3,350	...	6	...	2,581		32.8
	Jorang, 1972	5,500	...	8	...	10,381		37.4
	Kerang, 1977	3,900	...	7	2	3,270		36.4
	Kopar, 1974	5,300	...	14	...	3,029		37.5
	Kotabatak, 1952	5,500	...	66	8	18,847		28.4
	Libo, 1968	5,900- 6,000	23	3	8	10,968		34.6-42.8
	Lincak, 1981	2,570	...	1	...	755		33.0
	Menggala, 1968	3,765- 3,850	...	22	3	12,613		32.4-33.8
	Minas, 1944	2,000	...	365	64	265,895		35.3
	Obor, 1978	7,370	...	1	...	763	4,754,930,000	39.8
	Pager, 1974	4,300	...	23	2	15,174		37.1
	Pelita, 1977	6,600	...	3	...	651		36.2
	Pematang, 1959	3,750- 5,300	...	43	5	9,220		31.9-35.5
	Pemburu, 1981	2,300	...	1	...	1,743		35.1
	Petani, 1964	4,750	...	29	1	13,442		32.8
	Petapahan, 1971	4,500	...	22	4	7,839		28.2
	Pinang, 1971	3,950	...	18	...	5,544		29.6
	Pudu, 1972	5,950	...	12	...	1,975		35.4
	Puncak, 1979	2,400	...	6	...	5,514		35.5
	Pungut, 1951	3,400	...	19	...	4,018		37.5
	Rangau, 1968	6,060	...	9	1	626		41.1
	Serunı, 1972	3,000	...	22	1	5,809		35.2
	Sikladi, 1975	4,340	...	14	...	4,106		37.9
	Sintong, 1971	3,400- 4,530	...	20	...	4,965		31.6-36.0
	Tandun, 1969	3,000	...	7	...	1,450		34.5
	Telinga, 1975	4,205	...	5	1	915		34.5
	Topaz, 1977	5,200	...	7	...	7,044		32.9
	Ubi, 1976	4,350	...	11	1	4,509		34.0
	Duri, 1941	770	...	615	37	11,824		22.7
	Kulin, 1970	2,050	...	48	7	2,016		19.6
	Other	...	...	27	3	2,415		...
CAL ASIATIC TOPCO	Beruk, 1974	1,750	...	12	...	21,250	16,299,755	38.0
	Beruk NE, 1976	1,800	...	1	2	982	881,809	39.6
	Bungsu, 1976	2,050	...	3	...	2,674	2,119,686	39.7
	Damar, 1974	4,650	...	4	...	624	3,467,720	35.0
	Gatam, 1977	2,385	...	3	...	780	313,836	33.5
	Kasikan, 1972	660	...	14	6	1,253	3,442,720	27.6
	Osam, 1978	900	...	5	...	288	282,499	31.8
	Paitan, 1978	2,315	...	1	...	193	324,867	31.7
	Pedada, 1973	950	...	15	1	19,712	37,730,912	31.2
	Sabak, 1974	2,350	...	11	1	5,850	11,307,827	35.8
	Terantam, 1973	900	...	3	1	72	331,231	31.8
	Zamrud, 1975	3,600	...	8	5	12,469	2,027,347	40.2
	Langgak, 1976	1,300	...	12	1	949	1,733,952	31.9
	Buaya, 1978	2,035	...	1	...	80		28.0
	Lindai, 1971	1,100	...	10	2	1,688	18,154,323	30.8
	Tanjungmedan, 1976	2,770	...	1	...	797		29.0
STANVAC (Central Sumatra)	Sago, 1940	1,800	...	68	NA	2,454	115,927,681	34.0
	Lirik, 1939	1,600	...	36	NA	1,961	34,277,907	34.0
	Molek, 1956	2,600	...	28	NA	2,066	10,210,123	34.0
	N. Pulai, 1941	1,800	...	22	NA	1,231	35,138,103	34.0
	S. Pulai, 1941	1,800	...	16	NA	785	3,845,895	34.0
	Binio, 1972	1,600	...	23	NA	1,220	10,112,738	34.0
	Pekan, 1976	3,700	...	32	NA	2,142	4,844,656	35.0
	Merbau, 1979	2,700	...	22	NA	2,441	2,976,042	36.0
	Kerumutan, 1980	3,000	...	15	NA	1,766	1,345,435	35.0
	N. Merbau, 1980	2,600	...	9	NA	1,542	966,248	36.0
	Panduk, 1981	2,500	1	5	NA	812	327,850	46.0
	Other	...	...	11	...	706	10,947,563	...
STANVAC (South Sumatra)	Talang Akar, 1922	2,800	...	39	NA	804	359,695,411	35.0
	Benakat, 1932	1,600	...	62	NA	2,344	131,459,034	35.0
	Jirak, 1930	2,300	...	26	NA	649	55,687,395	35.0
	Raja, 1940	6,000	35	3	NA	8,525	26,719,376	38.0
	Abab, 1951	6,000	10	17	NA	2,384	36,946,875	36.0

	WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	No. of wells: Flow	No. of wells: Artificial lift	No. of wells: Shut-in	B/d average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
		Ibul, 1970	5,700	3	10	NA	1,066	18,391,150	36.0
		Rambutan, 1972	4,500	5	2	NA	301	2,812,190	42.0
		Other	...	10	5	NA	744	18,723,101	...
	ARCO (Java Sea)	• Ardjuna, 1969	2,380- 7,250	84	63	28	119,776	360,327,100	37.0
		• Arimbi, 1972	2,943	1	10	...	4,597	16,979,528	33.0
	ARCO (N.E. Kalimantan)	Sembakung,* 1976	2,600	...	...	16	...	10,467,463	36.0
*With Phillips.		Bangkudulis, 1980	3,250	...	...	1	...	85,045	39.5
	PHILLIPS GROUP	Salawati, 1976	5,749	...	5	6	3,689	22,793,399	39.2
	ROY M. HUFFINGTON INC.	Badak, 1972	5,800- 8,500	31	...	13	6,690	26,056,100	38.0
		Nilam, 1974	8,200- 9,400	9	...	18	4,266	3,136,500	32.0
		Pamaguan, 1974	2,000- 4,600	5	...	8	839	1,897,200	30.0
		Badak,[b] 1972	3,500-14,500	34	...	26	12,345	21,735,900	48.0
		Nilam,[c] 1974	7,600-13,100	...	...	69	...	11,188	48.0
		Seberah,[c] 1973	2,800- 8,900	...	...	8	...	565,000	58.0
	TOTAL/INPEX	• Bekapai, 1972	4,600- 5,600	22	...	9	29,000	107,000,000	40.0
		• Handil, 1974	3,000- 9,000	110	8	18	149,000	350,000,000	31.0
	UNION OIL	• Attaka,* 1970	7,500	61	...	8	78,870	322,871,698	43.0
		• Melahin, 1972	7,500	6	...	...	1,180	4,405,888	26.0
		• Kerindingan, 1972	7,000	5	...	3	870	4,095,888	31.0
		• Sepinggan, 1973	11,150	13	...	2	4,930	29,989,322	35.0
*With Inpex		• Yakin, 1976	5,100	10	...	2	1,470	5,246,899	18.0
	AARNL	Bula	280- 700	...	44	39	584	4,610,665	22.5
	ASAMERA	Tualang, 1973	2,631	12	11	27	4,187	23,958,479	49.9
		Djulu Rayeu, 1968	2,832	12	1	49	428	11,497,979	53.6
		Peudawa, 1980	3,083	5	1	9	1,042	1,165,738	48.1
		Peutouw, 1980	3,072	4	1	5	741	294,733	56.5
		Kluang, 1913	2,591	17	14	47	980	835,107	42.6
		Mangunjaya, 1934	2,700	3	7	96	511	569,347	32.0
		Other	...	18	7	181	780	19,137,064	...
	CONOCO GROUP	• Udang, 1974	5,595	15	7	4	28,517	29,300,000	40.0
	IIAPCO	• Cinta, 1970	3,500	...	36	12	18,740	141,708,000	34.0
		• Selatan, 1971	4,000	...	14	5	3,729	15,917,000	19.5
		• Zelda, 1971	7,500	5	28	6	17,177	12,788,000	35.0
		• Gita, 1972	7,000	...	7	...	1,790	4,915,000	34.5
		• Kitty, 1973	2,700	...	6	...	1,729	10,906,000	18.0
		• Nora, 1973	3,200	...	5	...	1,249	7,202,000	29.0
		• Rama, 1974	3,200	3	39	11	12,298	69,722,000	31.0
		• Krisna, 1979	4,500	1	30	2	41,475	28,024,000	35.0
		• Yvonne, 1980	4,500	...	6	...	3,199	1,992,000	36.0
		• Farida, 1982	8,000	2	10	...	6,500	722,000	28.0
		• Titi, 1982	8,000	...	2	...	9,600	221,000	30.5
	MOBIL OIL	Arun,[c] 1971	10,600	14	...	3	72,900	94,866,000	54.7
	PETROMER TREND	Canderawasih, 1976	3,500	...	7	1	1,344	8,737,704	28.1
		Jaya, 1973	3,050	...	12	...	4,027	29,908,990	41.4
		Kasim, 1973	3,350	...	16	...	5,688	32,852,983	37.4
		Walio, 1975	2,750	...	160	17	29,101	104,554,769	33.8
		Other	...	...	6	2	284	2,393,936	...
	TESORO	Samboja, 1909	360- 4,380	...	29	19	690	63,261,436	21.0
		Sanga Sanga, 1897	370- 4,950	16	114	68	4,284	259,294,732	32.0
		Tarakan, 1906	200- 3,540	4	133	45	1,864	206,269,511	20.0
	LEMIGAS	All fields, 1893-1909	2,155- 2,297	NA	NA	NA	NA	129,799,000	...
		Total Indonesia		**897**	**3,453**	**2,515**	**1,386,938**	**9,975,382,572**	
IRAN[e]	NIOC	Agha Jari, 1936	7,440						34.0
		Ahwaz Asmari, 1958	8,150						32.0
		Ahwaz Bangestan, 1958	12,000						24.3
		Bibi Hakimeh, 1961	4,570						29.9
		Binak, 1959	10,440						29.9
		Chillingar, 1974	3,350						39.3
		Cheshmeh Khush, 1967	10,700						27.7
		Dehluran, 1972	11,900						34.3
		Gachsaran, 1937	3,400						31.0
		Haft Kel, 1927	1,980						37.7
		Karanj, 1963	5,360						33.9
		Kharg, 1961	10,900						31.6
		Kupal, 1965	10,500						32.8
		Lab-e Safid, 1968	4,350						35.3
		Mansuri, 1963	7,100						28.4
		Marun, 1963	9,400						32.6
		Masjid-e Suleiman, 1908	1,600						39.3
		Naft Safid, 1938	5,000	NA	NA	NA	1,504,000	30,365,489,000	36.8
		Paris, 1964	4,670						38.8
		Par-e Siah, 1964	4,250						37.7
		Pazanan, 1961	7,250						37.2
		Rag-e Safid, 1964	7,230						28.6
		Ramin, 1966	12,200						32.9
		Ramshir, 1962	8,750						27.6
		Sulabedar, 1971	3,400						30.4
		Naft-e Shah, 1923	2,000- 3,000						43.0

WORLDWIDE PRODUCTION		Name of field, discovery date	Depth, feet	No. of wells: Flow	Artificial lift	Shut-in	B/d average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
	SIRIP	• Bahregansar, 1960	9,000						30.0
		• Hendijan, 1968	11,000						23.0
		• Nowruz, 1966	8,200						21.0
	IMINOCO	• Rakhsh, 1969	7,650						35.8
		• Rostam, 1966	7,000						34.4
	AMOCO	• Ardeshir, 1969	2,800						27.0
		• Cyrus, 1962	7,000						18.3
		• Darius, 1961	11,000						34.0
		• Fereidoon, 1966	7,000						28.5
	LAPCO	• Sassan, 1965	7,500- 8,100						34.0
		Total Iran		NA	NA	NA	1,504,000	30,365,489,000	
IRAQ[e]		Ain Zalah, 1939	5,200- 6,500						31.0
		Bai Hassan, 1953	4,800- 5,400						34.0
		Butmah, 1953	3,900						30.0
		Hamrin, 1973	2,000						...
		Jambur, 1954	5,500-12,500						38.0
		Kirkuk, 1927	2,800- 4,200	NA	NA	NA	1,030,000	16,080,740,000	36.0
		Naft Khaneh, 1909	3,500						42.5
		Rumaila North, 1958	10,000						34.0
		Rumaila, 1953	10,800						35.0
		Zubair, 1949	11,000						34.2
		Abu Ghurab	...					...	27.7
		Buzurgan	...					...	27.7
		Jabal Fauqui	...					...	...
		Lahis	...					...	...
		Total Iraq		NA	NA	NA	1,030,000	16,080,740,000	
ISRAEL	LAPIDOTH	Heletz-Brur, 1955	5,200	10	10	...	175	12,076,129	28.0
		Kochav, 1962	5,500	5	3	...	47	4,015,165	27.0
		Ashdod, 1976	8,409	2	...	...	46	53,576	34.0
		Zuk Tamrur,* 1982	6,107	1	...	...	...	...	27.0
*Zuk Tamrur was placed on production in August 1982.		**Total Israel**		18	13	...	268	16,144,870	
ITALY	AGIP	Cavone, 1979	10,663-18,068	2	...	7	3,189	1,187,540	24.8
		• Gela, 1956	11,280-11,350	45	14	20	9,553	103,555,219	6.6-16.4
		Malossa, 1973	17,881-21,231	8	...	3	5,927	18,027,743	55.0
		Pisticci-S. Cataldo, 1960	6,820- 6,880	6	...	3	392	5,742,748	11.4
		Other	...	11	1	23	388	14,456,753	...
	AGIP/SOMICEM	Ragusa, 1954	5,690- 5,860	...	30	13	4,258	117,517,653	19.5
	AGIP/SHELL	• Nilde, 1977	6,068	1	...	...	...	540,975	39.3
	ELF-AQUITAINE	• Santa Maria a Mare, 1974	8,487	7	...	1	4,680	10,815,603	21.5
		Total Italy		80	45	70	28,387	271,844,234	
IVORY COAST	Esso Cote d'Ivoire	• Belier,* 1975	6,500	11	...	5	9,377	5,141,660	33.0
	Phillips	• Espoir,† 1980	6,500-11,000	5	...	...	...	...	33.0
*Development still in progress. †First production was in August 1982. Current rate is about 20,000 b/d.		**Total Ivory Coast**		16	...	5	9,377	5,141,660	
JAPAN	JAPEX	• Aga-Oki, 1972	7,590	12	...	12	866	3,368,229	43.7
		Higashi-Niigata, 1965	4,500- 9,200	16	...	8	297	6,372,358	53.9
		Sarukawa, 1958	2,000- 3,200	6	34	10	529	9,404,933	32.3
		Yoshii, 1968	8,000	12	...	13	1,310	6,685,873	61.8
		Other	...	107	4	59	1,269	25,851,806	...
	TEIKOKU OIL	Kubiki, 1959	1,100- 6,400	26	77	42	588	11,758,681	29.7
		Minami-Aga, 1964	7,300- 9,600	11	2	13	490	12,633,883	38.5
		Yabase, 1933	1,100- 5,800	2	61	10	338	32,354,584	33.0
		Other	...	6	21	6	104	2,343,187	...
		Total Japan		198	199	173	5,791	110,773,534	
KUWAIT[e]	KOC	Ahmadi, 1953	4,800						32.9
		Bahra, 1956	8,500						...
		Burgan, 1938	4,800						32.0
		Magwa, 1951	4,800	530	...	514	633,000	20,680,116,000	33.6
		Minagish, 1959	10,000						34.2
		Raudhatain, 1955	8,600						34.7
		Sabriya, 1956	8,300						31.5
		Umm Gudair, 1963	9,000						26.7
		Total Kuwait		530	...	514	633,000	20,680,116,00	
LIBYA	AGIP	Bu Attifel, 1968	14,300	20	...	10	69,000	481,920,000	41.0
	ELF[e]	Majid, 1968	9,000- 9,800	4	...	...	4,900	19,879,500	40.0
		Don Mansour Unit	NA	2	...	3	1,250	22,863,500	32.0
		El Meheiriga	NA	3	...	1	7,160	25,020,500	46.0

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	No. of wells: Flow	No. of wells: Artificial lift	No. of wells: Shut-in	B/d average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
LNOC[6]	Arshad, 1966	10,100						42.0
	Jebel, 1962	8,100						38.0
	Nasser, 1959	5,500- 7,600						38.0
	Lehib-Dor Marada Unit, 1965	9,500						50.0
	Raguba, 1961	5,400						43.0
	Beda, 1959	4,000						36.0
	Bualawn, 1972	6,000	NA	NA	NA	296,379	5,505,199,324	40.0
	Dor, 1967	6,400						33.2
	Kotla, 1963	5,500						34.0
	Sahabi B & D, 1961	9,000-10,000						39.0
	Sarir, 1961	9,000						37.2
MOBIL	Amal, 195_	9,900	...	27	148	17,424	691,720,000	37.5
	Ora, 1962	7,250	...	18	53	1,153	96,116,000	40.2
	Ghani, 1978	6,000	13	...	26	6,576	10,001,000	40.0
	Other	...	...	...	114	311	108,332,000	...
OASIS	Bahi, 1968	3,600- 3,750	...	48	...	18,209	322,044,000	43.4
	Belhedan, 1962	7,000	...	4	...	2,353	45,466,000	33.6
	Dahra, 1959	3,100- 3,700	...	52	...	15,845	427,671,000	37.0-41.0
	Defa, 1969	5,400- 5,900	...	107	...	106,110	807,720,000	35.6
	Gialo, 1961	2,200- 6,300	...	205	...	89,403	1,707,660,000	35.7
	Harash, 1978	7,400	...	5	...	4,685	8,330,000	34.6
	Khalifa, 1978	5,400- 7,000	...	5	...	1,950	4,579,000	34.6
	Masrab, 1978	10,000	..	10	...	4,558	10,788,000	39.6
	Samah, 1961	9,000	...	5	...	9,640	291,083,000	33.4
	Waha, 1960	6,600	...	33	...	38,441	813,405,000	36.0
	Zaggut, 1962	6,000	...	3	...	1,176	21,928,000	36.4
OCCIDENTAL	Ali, 1975	3,900	...	1	1	900	4,538 311	50.0
	Almas, 1975	4,000	...	7	1	2,100	15,444,869	49 5
	Intisar A, 1967	9,750	9	...	10	33,000	667,067,083	45.0
	Intisar B, 1974	9,600	2	...	...	1,000	5,149,230	50.0
	Intisar C, 1967	9,650	3	...	3	1,600	85,129,705	37.5
	Intisar D, 1967	9,400	15	...	11	60,500	922,274,139	39.0
	Intisar E, 1968	5,300- 7,100	...	8	3	4,000	11,900,212	34.7
	Nafoora-Augila, 1966	2,200-10,000	...	...	...	16,600	747,000,000	35.5
	Aswad, 1978	6,250	8	...	...	4,500	8,389,115	46.0
	Sabah, 1977	5,500	4	24	1	31,400	37,494,588	42.0
	Zella, 1977	6,750	...	34	1	21,000	34,529,758	48.1
	Other	7,900- 8,900	...	1	2	400	1,421,566	40 4
*Cumulative estimated	**Total Libya**		**83**	**597**	**400**	**867,000**	**13,959,524,000**	
MALAYSIA ESSO	• Bekok, 1976	5,500	21	...	9	40,900	27,724,000	47.6
	• Pulai, 1973	4,300	13	6	3	27,500	42,880,000	42.3
	• Tapis, 1975	6,700	53	...	24	56,600	88,616,000	43.0
	• Tembungo, 1971	6,000	6	...	6	3,200	16,493,000	38.0
SARAWAK SHELL BERHAD	• Bakau, 1971	11,000		3	...	928	6,155,749	39.0
	• Baram, 1963	9,500		24	13	16,193	104,300,549	40.5
	• Baronia, 1967	11,000		22	18	24,370	106,599,352	42.0
	• Betty, 1967	...		7	2	14,325	24,434,699	38.0
	• Fairley-Baram, 1963	...		2	...	995	5,523,962	40.0
	• West Lutong, 1966	...		18	9	17,276	102,912,761	39.5
	Miri, 1911	...		...	...	...	79,727,300	27.0
	• Temana, 1972	...		16	2	11,683	8,574,026	35.0
	• Tukau, 1966	...		15	21	19,504	47,884,057	29.2
SABAH SHELL	• Samarang, 1972	...		30	32	55,238	139,191,221	37.0
	• South Furious, 1974	...		13	2	7,519	4,845,155	30.0
	• Erb West, 1972	...		8	1	3,497	719,796	30.0
	• St. Joseph, 1975	...		4	2	453	82,806	32.0
	• Barton, 1971	...		4	..	2,024	366,320	37.0
	Total Malaysia			**265**	**144**	**302,205**	**807,030,753**	
MEXICO PEMEX NORTH ZONE, NE	All fields	...	1	21	23	265	11,743,738	47.0
NORTH ZONE, N.	• Arenque, 1970	11,362	19	...	6	9,718	63,433,644	26.0
	Constituciones, 1956	6,350	53	82	87	8,643	65,695,967	17.0
	Ebano-Panuco, 1901	1,450	140	210	171	5,259	935,884,653	12.0
	Tamaulipas	4,200	61	78	87	8,080	63,541,548	19.0
	Other	...	97	102	94	425	22,627,672	...
NORTH ZONE, S.	Chicontepec, 1973	4,264	33	4	56	3,535	5,959,335	34.1
	• Isla de Lobos, 1963	6,875	2	...	...	499	20,424,592	40.0
	• Marsopa, 1974	10,198	7	...	3	1,862	11,895,969	39.0
	Naranjos-C. Azul, 1909	1,800	199	...	25	8,123	1,200,892,889	22.0
	Tres Hermanos, 1959	6,960	22	...	71	3,602	101,161,529	21.0
	Other	...	91	24	64	780	23,965,223	...
CENTRAL ZONE, POZA RICA	• Atun, 1966	9,040	2	...	6	1,512	34,390,229	37.0
	• Bagre, 1973	10,919	6	...	3	6,255	34,904,109	33.0
	Escolin, 1942	7,216	...	100	84	20,201	195,236,417	26.3
	Hallazgo, 1955	10,170	...	38	37	4,874	69,083,888	25.0
	Jiliapa, 1958	7,390	...	26	46	1,101	26,998,460	34.0
	Mecatepec, 1941	7,544	1	40	37	3,214	132,639,324	29.8
	Miquetla, 1959	6,480	10	63	28	2,330	23,649,362	35.0

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	No. of wells Flow	Artificial lift	Shut-in	B/d average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
	Poza Rica, 1930	7,090	6	148	84	32,234	854,741,294	35.0
	Pres. Alemán, 1949	8,036	71	47	53	3,867	28,935,390	26.0
	Remolino, 1962	10,745	..	37	48	1,112	19,986,601	29.5
	San Andrés, 1956	10,410	8	108	109	23,393	320,510,919	29.0
	Other	...	77	136	266	9,130	89,612,078	...
CENTRAL ZONE, N. FAJA DE ORO	Acuatempa, 1955	4,085	4	...	16	77	25,628,819	21.0
	El Muro, 1965	3,966	9	...	3	1,470	18,710,284	17.0
	E. Ordoñez, 1952	5,220	10	...	8	1,418	56,308,696	21.0
	Ocotepec, 1953	3,737	13	...	2	546	19,241,846	20.0
	Santa Agueda, 1953	4,780	15	...	28	1,421	101,067,462	16.0
	Other	...	44	4	45	1,540	56,245,722	...
CENTRAL ZONE, VERACRUZ	Matapionche, 1974	11,129	31	...	22	8,497	16,533,831	37.0
	Other	...	23	...	49	2,650	26,349,218	...
SOUTHERN ZONE, AGUA DULCE	Blasillo, 1967	7,216	17	20	17	6,792	17,690,342	40.0
	Cinco Presidentes, 1960	6,862	11	74	43	10,942	236,396,617	35.0
	El Burro, 1931	2,200	...	18	10	657	20,763,976	26.0
	La Venta, 1954	4,730	6	15	44	1,857	56,755,437	41.0
	Ogarrio, 1957	5,790	17	50	59	8,843	125,834,853	38.0
	Otates, 1965	7,469	2	8	3	1,370	23,077,243	39.0
	Rodador, 1971	11,398	7	14	5	1,953	5,484,723	26.0
	Sánchez Magallanes, 1957	4,240	4	93	141	7,374	124,377,303	27.0
	San Ramón, 1967	9,517	5	42	8	6,811	50,824,590	30.0
	Tonalá, 1928	1,770	...	45	23	1,095	75,984,854	28.0
	Other	...	...	2	5	102	39,250,565	...
SOUTHERN ZONE, COMALCALCO	Agave, 1977	13,450	11	...	4	54,073	62,256,935	41.7
	Arroyo Zanapa, 1978	14,599	1	...	...	3,063	6,364,253	38.9
	Arteza, 1977	11,800	1	...	4	4,151	25,395,774	26.4
	Ayapa, 1972	8,200	3	...	1	658	4,712,839	7.2
	Cacho López, 1977	14,250	...	...	1	...	2,247,989	39.0
	Cactus, 1972	14,100	12	...	11	22,638	247,120,136	31.5
	Carrizo, 1962	3,500	1	6	...	466	9,521,953	23.3
	Castarrical, 1967	10,080	1	28	18	2,319	35,345,667	29.3
	Comoapa, 1979	14,432	5	...	...	8,513	6,612,205	44.5
	Copano, 1977	11,890	3	...	...	6,735	4,710,279	43.9
	Cunduacán, 1974	13,775	12	...	11	69,132	340,425,355	28.9
	El Golpe, 1963	3,500	2	44	22	4,694	69,939,019	25.7
	Giraldas, 1977	15,225	18	...	1	77,727	47,084,286	37.0
	Iride, 1974	13,775	11	...	1	53,265	102,894,449	28.5
	Mecoacán, 1957	2,200	5	11	15	784	35,893,615	8.6
	Mundo Nuevo, 1977	11,800	5	...	2	13,428	16,575,226	46.0
	Níspero, 1974	14,100	6	...	5	39,516	91,380,170	34.4
	Ojiacaque, 1977	11,150	8	...	10	26,092	88,957,822	29.1
	Paredón, 1978	15,690	6	...	1	41,488	36,656,359	39.8
	Platanal, 1978	15,900	...	...	...	...	2,967,641	30.2
	Río Nuevo, 1975	14,950	7	...	...	38,322	39,754,699	34.8
	Samaria (Cret), 1973	14,209	43	...	8	257,422	745,123,275	31.0
	Santuario, 1966	9,617	5	10	4	5,228	28,676,796	37.0
	Sitio Grande, 1972	13,766	13	...	5	55,471	222,502,837	35.0
	Sunuapa, 1978	12,887	2	...	4	5,151	20,600,794	32.8
	Tintal, 1968	5,904	6	...	1	731	3,766,175	22.0
	Topan, 1978	11,172	1	...	1	659	1,019,829	25.4
	Tupilco, 1959	9,685	7	29	16	3,842	43,733,477	27.0
	Bellota, 1982	17,056	1	...	...	3,604	652,298	41.0
	Cardenas, 1979	17,548	10	...	1	37,022	10,053,886	38.0
	Chiapas, 1979	12,136	6	...	...	18,746	10,006,616	42.0
	Fenix, 1979	17,876	5	...	...	13,815	9,406,758	40.0
	Iris, 1979	14,432	6	...	1	8,078	4,705,423	39.2
	Jujo, 1980	17,548	1	...	...	16,280	9,029,251	32.0
	Muspac, 1982	9,676	1	...	...	261	47,175	57.0
	Tapijulapa, 1982	15,613	1	...	...	0.6	3,082	39.8
	Mora, 1981	...	1	...	...	...	...	38.1
	Other	...	...	2	10	320	25,030,715	...
SOUTHERN ZONE, EL PLAN	Agata, 1956	3,830	1	4	10	383	11,200,150	34.0
	Bacal, 1976	3,500	23	...	14	29,778	56,059,845	35.0
	Concepción, 1974	1,600	4	4	7	940	3,320,220	31.0
	Cuichapa, 1935	2,200	8	66	37	8,312	112,191,566	30.0
	El Plan, 1931	1,700	...	65	12	2,674	149,799,564	30.0
	Lacamango, 1973	1,700	11	10	6	2,397	8,165,703	26.3
	Los Soldados, 1953	4,492	4	15	3	920	22,550,851	32.0
	Other	...	4	7	4	230	37,188,068	...
SOUTHERN ZONE, NANCHITAL	Ixhuatlán Ote., 1965	1,960	3	10	22	1,363	8,375,990	22.6
	Moloacán, 1962	500	5	161	72	2,688	17,748,650	22.3
	Other	...	...	...	112	...	17,460,171	...
GULF OF CAMPECHE	• Cantarell, 1976	8,528	48	...	...	982,000	744,152,257	21.3
	• Abkatun, 1978	11,800	14	...	...	270,574	93,274,680	NA
	• Ku, 1979	10,000	4	...	...	105,617	35,150,879	NA
	• Pol, 1979	12,600	3	...	...	80,062	26,257,989	NA
	Total México		1,484	2,121	2,476	2,607,062	9,208,512,752	
MOROCCO[e]	Haricha, 1957	3,000	...	...	...	180	3,112,250	40.0
	Other	...	...	...	...	...	12,554,000	...
	Total Morocco		...	...	...	180	15,666,250	

WORLDWIDE PRODUCTION		Name of field, discovery date	Depth, feet	No. of wells: Flow	No. of wells: Artificial lift	No. of wells: Shut-in	B/d average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
NETHERLANDS	NAM (SHELL/ESSO)	DeLier-Munster, 1955	5,200		29	4	857	15,463,620	33.2
		Berkel, 1954	NA		5	4	616	111,437	32.1
		Ysselm-Ridderkerk, 1956	5,200		79	...	5,583	79,217,162	18.0
		Pynacker, 1955	NA		5	1	182	5,370,782	36.3
		Wassenaar, 1956	4,200		30	5	2,532	42,179,746	18.6
		Zoetermeer, 1957	3,200		20	2	761	8,721,046	16.4
		Schoonebeek, 1943	2,500		329	73	17,292	205,461,373	24.8
		Other	...		36	30	157	4,583,485	...
		Total Netherlands			**533**	**119**	**27,980**	**361,108,651**	
NEW ZEALAND	SHELL-BP-TODD	Kapuni,[c] 1959	10,318-11,775	6	2	3	5,469	26,700,000	54.0
	MAUI DEVELOPMENT LTD.	• Maui,[c] 1969	8,615-11,068	6	...	5	7,266	4,950,000	58.0
	PCNZ	McKee, 1981	7,848	...	...	4	...	*60,000	38.0
*Test production		**Total New Zealand**		**12**	**2**	**12**	**12,735**	**31,710,000**	
NIGERIA	AGIP-PHILLIPS	Agwe, 1977	10,800	1	...	...	1,200	595,000	55.0
		Akri, 1973	9,600-10,600	8	...	3	12,900	42,658,000	39.9
		Akri West, 1975	9,900-10,200	...	...	2	...	482,000	31.4
		Ashaka, 1968	9,700-12,000	1	...	...	560	1,218,000	41.0
		Beniku, 1974	12,000	1	...	1	940	2,223,000	44.3
		Clough Creek, 1977	10,500-13,000	5	...	1	6,400	1,154,000	45.0
		Ebegoro, 1976	11,500-12,000	6	...	3	13,500	40,445,000	35.7
		Ebocha, 1965	8,000-10,900	6	...	11	6,200	91,355,000	38.5
		Idu, 1973	7,750-10,700	5	...	5	1,100	23,863,000	28.0
		Kwale, 1968	10,000-11,500	1	...	1	230	779,000	44.3
		M'Bede, 1966	7,300- 9,400	8	...	7	13,100	129,177,000	41.1
		Obama, 1975	11,600-14,300	7	...	1	20,500	56,473,000	38.2
		Obiafu, 1973	9,300-12,200	12	...	4	9,200	57,545,000	41.3
		Obrikom, 1973	8,000-10,000	4	...	7	4,300	42,582,000	41.5
		Odugri, 1972	12,500	2	...	...	3,100	6,301,000	44.8
		Ogbogene, 1976	11,500-12,500	1	...	1	1,100	3,375,000	37.0
		Okpai, 1968	10,000-12,000	8	...	...	6,600	8,092,000	42.3
		Omoku West, 1975	11,500	1	...	...	1,100	3,547,000	35.0
		Oshi, 1974	9,600-11,300	9	...	2	9,000	43,936,000	39.5
		Tebidaba, 1975	10,300-13,300	8	...	?	15,700	74,912,000	35.5
		Umuoru, 1975	14,100	2	...	1	1,100	571,000	43.0
	PHILLIPS	Gilli-Gilli, 1967	7,600-14,000	2	...	2	1,107	1,203,950	47.4
	ASHLAND	Izombe, 1974	9,500	11	...	3	11,700	22,160,000	43.2
		Ossu, 1974	9,500	2	...	2	1,300	1,383,000	44.0
	ELF	Aghigo, 1972	6,000- 8,500	1	10	14	4,662	13,571,550	24.6
		Okpoko, 1967	6,000- 7,500	5	2	6	4,280	13,189,940	19.0
		Obodo-Jatumi, 1966	6,000-11,000	12	...	4	10,532	35,829,880	29.0
		Upomami, 1965	6,000- 7,000	1	7	9	2,032	9,871,030	17.5
		Obagi, 1964	6,000-10,000	40	7	29	66,082	235,164,485	24.0
		Erema, 1972	9,800	1	...	...	1,378	5,042,430	30.0
	GULF	Abiteye, 1970	5,750- 9,400	15	...	3	15,725	40,004,610	37.8
		• Delta, 1965	5,600- 9,500	23	...	4	18,381	131,798,609	34.0
		• Delta South, 1965	7,100-10,179	13	...	14	13,980	212,659,755	38.6
		• Isan, 1970	5,900- 9,000	8	...	3	5,608	36,266,651	39.4
		Makaraba	7,100-12,005	21	2	3	21,616	44,501,812	31.5
		• Malu, 1969	4,800- 6,300	9	...	9	13,488	66,556,095	40.0
		• Mefa, 1965	8,570-12,030	4	...	1	2,103	9,255,616	37.1
		• Meji, 1965	5,200-10,900	19	...	3	19,398	113,342,663	32.9
		• Meren, 1965	5,000- 7,500	31	...	19	33,953	385,166,047	31.3
		• Okan, 1964	5,500- 9,245	55	...	11	47,521	357,112,054	36.0
		• Parabe-Eko, 1968	4,500- 8,200	15	...	10	8,179	84,729,416	36.7
		Utonana, 1971	7,400- 9,165	2	...	3	2,538	5,611,596	35.6
		• W. Isan, 1971	7,825-10,229	9	...	...	6,177	27,249,676	38.1
		Yoria South, 1974	11,389-12,635	...	...	2	...	822,618	42.0
		Jisike, 1975	6,300- 7,600	3	...	1	2,922	2,573,717	44.0
		Robertkiri, 1964	11,484-13,190	2	...	...	957	1,578,104	36.8
		• Tapa, 1978	8,150-10,842	10	...	...	16,592	3,994,821	36.0
	MOBIL	• Adua, 1967	6,970	6	...	2	7,981	26,607,383	30.3
		• Asabo, 1966	5,600	9	1	3	14,611	125,131,061	32.4
		• Ekpe, 1966	8,200	9	1	5	13,356	156,244,419	30.3
		• Ekpe-WW, 1977	6,810	10	...	1	11,095	16,908,308	30.3
		• Eku, 1966	5,42						

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	No. of wells Flow	Artificial lift	Shut-in	Bbl average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
	Ugh-Oweh, 1964	12,300	8	...	...	1,974	85,872,081	28.0
	Ugh-Kokori, 1960	8,000- 9,800	21	...	...	16,587	277,975,135	42.0
	Ugh-Afiesere, 1966	8,000- 9,000	23	...	...	8,919	91,725,089	22.0
	Ugh-Eriemu, 1961	12,500	13	...	...	4,049	32,791,781	26.0
	Ugh-Ughelli-East, 1959	11,800	6	...	...	1,464	81,977,475	35.0
	Ugh-Ughelli-West, 1963	7,400-10,200	4	...	...	1,231	26,594,044	21.0
	Ugh-Utorogu, 1964	9,000	12	...	...	2,842	115,541,267	25.0
	Ugh-Oroni, 1964	12,000	3	...	...	1,669	23,006,128	22.0
	Ugh-Warri-River, 1961	12,264	1	...	...	491	12,492,476	31.0
	Ugh-Evwreni, 1968	10,900	4	...	...	800	31,756,414	28.0
	Ugh-Rapele, 1965	12,934	2	...	...	489	20,319,548	42.0
	Ugh-Isoko 1960	NA	...	...	...	674	4,301,848	19.0
	Ugh-Osioko, 1967	12,885	...	...	...	120	6,680,044	27.0
	Forc-Odidi, 1967	10,980	20	...	...	16,666	161,292,278	37.0
	Forc-Opukushi, 1963	7,823	11	...	...	14,529	61,944,683	29.0
	Forc-Jones Creek, 1967	7,000- 9,000	17	...	...	13,837	334,852,985	29.0
	Forc-Opuama, 1973	NA	2	...	...	3,173	17,860,331	41.0
	Forc-Egwa, 1967	9,350	12	...	...	7,139	108,600,972	37.0
	Forc-[illegible]ados Yokri, 1968	10,859	59	...	...	69,018	410,520,951	22.0
	Forc-Batan, 1968	11,000	9	...	...	3,935	45,933,450	27.0
	Forc-Escravos Beach, 1969	9,931	6	...	...	4,956	43,014,719	36.0
	Forc-Otumara, 1969	8,176	19	...	...	21,498	105,014,700	25.0
	Forc-Saghara, 1970	8,590	5	...	...	5,695	21,424,961	31.0
	Forc-Ajuju, 1970	13,324	1	...	...	327	8,158,563	27.0
	Forc-Benisede, 1973	...	13	...	...	13,590	47,476,619	23.0
	Node-Sapele, 1970	12,788	15	...	...	11,834	80,337,793	42.0
	Node-Amukpe, 1970	12,378	1	...	...	770	10,187,988	43.0
	Node-Oben, 1972	12,036	14	...	...	16,282	62,368,395	40.0
	Forc-Opukushi N., 1977	NA	1	...	...	1,072	968,092	30.0
SHELL (EAST)*	Phl-Bomu, 1958	6,500- 7,500	23	...	...	20,727	328,221,043	36.0
	Phl-Imo River, 1959	5,800-10,000	19	...	...	31,956	398,149,152	32.0
	Phl-Nkali, 1963	12,000	4	...	...	2,769	25,270,234	42.0
	Phl-Elelenwa, 1959	11,000	4	...	...	4,133	25,542,346	39.0
	Phl-Otamini, 1973	NA	1	...	...	1,757	11,274,454	36.0
	Phl-Umuechem, 1969	5,800-10,700	4	...	...	5,968	135,207,704	36.0
	Phl-Akpor, 1965	NA	1	...	...	449	1,524,013	36.0
	Phl-Tai, 1965	NA	1	...	...	124	3,801,554	36.0
	Phl-Apara, 1960	9,000	3	...	...	2,928	17,363,378	36.0
	Phl-Bodo-West, 1959	9,700	8	...	...	2,153	68,142,541	29.0
	Phl-Afam, 1956	6,000	9	...	...	2,843	44,825,013	45.0
	Phl-Korokoro, 1959	8,000- 9,800	6	...	...	2,695	77,731,859	36.0
	Phl-Yorla, 1970	11,917	8	...	...	4,784	48,960,662	44.0
	Phs-Bonny, 1959	12,254	11	...	...	13,428	74,117,668	36.0
	Phs-Alakiri, 1959	10,000	5	...	...	3,182	57,746,008	40.0
	Phs-Buguma Creek, 1960	12,195	5	...	...	730	12,456,405	42.0
	Phs-Cawthorne Channel, 1963	11,000	18	...	...	31,158	199,385,524	38.0
	Phs-Krakama, 1958	11,530	8	...	...	2,838	16,216,836	24.0
	Phs-Ekulama, 1958	10,483	22	...	...	25,723	137,353,559	32.0
	Phs-Soku, 1958	11,500	18	...	...	9,476	84,352,596	31.0
	Phs-Orubiri, 1971	NA	3	...	...	3,409	11,457,412	38.0
	Egb-Oguta, 1965	10,300	16	...	...	16,638	107,280,765	46.0
	Egb-Assa, 1961	11,300	...	...	...	551	4,349,263	21.0
	Egb-Egbema, 1960	10,470	11	...	...	3,801	45,259,036	32.0
	Egb-Egbema West, 1965	NA	5	...	...	3,637	70,929,183	45.0
	Egb-Ahia, 1965	11,500	3	...	...	6,065	76,247,676	37.0
	Eade-Utapate South, 1974	NA	9	...	...	9,033	22,379,898	44.0
	Eade-Opobo South, 1974	NA	4	...	...	5,290	6,565,540	44.0
	Cesw-Nun River, 1960	NA	3	...	...	6,144	24,701,962	39.0
	Cesw-Enwhe, 1965	NA	...	...	...	276	2,611,130	24.0
	Cesw-Etelebou, 1971	12,000	6	...	...	18,999	91,398,011	33.0
	Cesw-Kolo Creek, 1960	12,000	15	...	...	23,539	83,101,919	42.0
	Cesw-Diebu Creek, 1966	NA	6	...	...	7,682	82,893,319	43.0
	Phl-Isimiri, 1964	5,900-11,000	5	...	...	2,511	32,494,199	28.8
	Phl-Ebubu, 1958	8,200	3	...	...	402	18,174,471	29.0
	Phl-Onne, 1965	10,384	2	...	...	1,154	7,507,564	29.0
	Phl-Obigbo-North, 1963	6,500-10,000	27	...	...	20,762	140,899,773	22.0
	Phl-Ajokpori, 1967	NA	1	...	...	484	3,422,162	29.0
	Phl-Agbada, 1960	8,000-12,000	29	...	...	18,433	132,003,500	32.1
	Phl-Akuba, 1967	NA	1	...	...	518	3,308,003	29.0
	Phl-Obele, 1963	10,000	3	...	...	638	4,509,415	26.0
	Cesw-Adibawa, 1967	11,950	6	...	...	12,114	42,262,797	26.0
	Cesw-Adibawa NE, 1973	NA	1	...	...	2,614	8,323,439	26.0
	Cesw-Ubie, 1961	14,380	3	...	...	3,619	20,368,372	28.0
	Phl-Obeakpu, 1975	NA	2	...	...	2,776	10,313,757	45.0
	Cosw-Nembe Creek, 1973	NA	34	...	...	50,828	87,115,109	35.0
	Phs-Akaso, 1979	NA	1	...	...	839	596,667	30.0
	Other	...	...	...	...	189	25,128,394	...
TEXACO-CHEVRON	• Pennington, 1965	5,000- 7,000	3	...	7	1,842	20,726,933	37.5
	• Middleton, 1972	5,000- 7,000	1	...	6	765	10,477,690	37.5
	• North Apoi, 1973	4,000- 7,000	16	...	1	35,492	86,630,952	36.5
	• Funiwa, 1978	5,000- 7,000	7	...	...	...	475,295	37.5
	Total Nigeria		**1,290**	**32**	**287**	**1,307,452**	**9,222,190,485**	

*Total of wells shut in as of May 1982 was 1,054

WORLDWIDE PRODUCTION		Name of field, discovery date	Depth, feet	No. of wells: Flow	Artificial lift	Shut-in	B/d average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
NORWAY	PHILLIPS*	• Ekofisk, 1969	10,000	32	...	5	161,229	658,207,021	41.1
		• West Ekofisk, 1970	10,300	9	...	1	14,319	61,709,521	43.9
		• Cod, 1968	9,500	6	...	...	7,914	10,510,020	55.0
		• Tor, 1970	10,000	11	...	2	34,661	80,423,817	38.0
		• Albuskjell, 1972	10,400	17	...	1	25,794	29,806,340	45.0
		• Edda, 1972	10,480-10,600	7	...	...	8,973	15,227,209	41.5
		• Eldfisk, 1970	9,350-10,000	24	...	2	79,419	96,098,098	37.6
	MOBIL	• Statfjord, 1974	9,000	12	...	...	†184,303	†106,525,000	39.0
	CONOCO	• Murchison, 1975	9,900	13	...	2	†17,657	†8,343,000	38.0
		Total Norway		**131**	**...**	**13**	**534,269**	**1,066,850,026**	
OMAN	PDO	Al Huwaisah, 1969	5,500	30		5	24,382	125,770,744	38.9
		Fahud, 1963	2,000- 6,080	96		47	60,528	616,406,037	32.8
		Ghaba North, 1972	2,500- 6,100	9		4	9,149	32,463,858	38.4
		Habur, 1975	2,500- 5,800	1		2	1,017	3,545,883	16.3
		Lekhwair, 1974	7,500	19		20	8,664	31,667,670	37.8
		Natih, 1963	7,500	22		20	29,436	286,291,602	32.0
		Qarn Alam, 1972	1,370- 6,500	4		2	2,191	15,896,163	16.5
		Saih Nihaydah, 1972	8,700	13		...	26,781	96,629,860	40.0
		Saih Rawl, 1973	5,000-10,300	10		2	14,165	65,448,061	41.5
		Yibal-Shuaiba, 1963	8,465	91		1	88,088	353,313,252	38.3
		Marmul, 1977	3,400-11,200	78		4	40,173	20,498,533	22.1
		Qaharir, 1978	7,500	13		...	7,632	5,613,327	30.3
		Mahjour, 1979	11,700	1		1	707	376,435	41.0
		Birba, 1978	10,500	1		4	1,653	299,278	31.0
		Rahab, 1978	7,400	9		1	1,759	717,398	22.2
		Qata, 1979	6,200	2		...	769	161,777	29.4
		Qaharir, E., 1978	7,500	13		...	352	257,843	30.0
		Shibkah, 1968	NA	1		...	106	44,965	35.0
	ELF GROUP	Sahmah, 1978	12,400	3		1	12,000	6,600,000	44.5
		Total Oman		**416**		**114**	**329,552**	**1,662,002,686**	
PAKISTAN	UNION TEXAS	Khaskeli, 1981	3,500	3	...	2	1,250	225,000	39.0
	PAKISTAN PETROLEUM	Adhi, 1979	9,219- 9,245	2	...	...	724	93,688	30.3
	OGDC	Toot, 1968	14,900	5	...	...	1,704	5,263,573	38.0
	PAKISTAN OILFIELDS LTD.	Balkassar, 1946	8,398	...	3	9	577	30,576,834	26.0
		Dhulian, 1936	8,899	12	...	37	171	41,232,225	48.0
		Joya Mair, 1944	6,900	...	1	2	395	5,209,998	15.0
		Meyal, 1968	12,514	6	...	2	7,558	21,371,549	46.0-47.0
		Khaur, 1915	...	...	...	...	8	4,150,885	29.0
		Total Pakistan		**28**	**4**	**52**	**12,387**	**108,123,752**	
PERU	BELCO	• Peña Negra,* 1960	3,000- 8,500	23	131	46	10,562	80,514,000	38.0
		• Lobitos,* 1960	3,500- 7,500	8	98	61	10,020	30,483,000	38.0
		• Litoral, 1955	1,500- 6,000	3	85	44	4,640	29,366,000	36.0-40.0
		• Providencia, 1967	3,000- 7,000	8	43	28	1,340	18,152,000	38.0-40.0
	OCCIDENTAL	Bartra, 1979	6,500- 6,700	...	11	2	4,433	3,050,695	10.4
		Capahuari Sur, 1973	11,800-12,700	1	14	7	47,223	92,142,543	36.4
		Dorissa, 1978	9,800-10,600	2	6	3	13,071	11,100,593	32.2
		Forestal, 1973	9,000- 9,900	1	6	1	9,336	17,108,402	26.7
		Huayuri Sur, 1977	10,000-10,800	...	8	4	6,543	8,772,238	36.7
		San Jacinto, 1978	7,200- 7,950	2	8	4	8,718	4,524,279	32.2
		Shiviyacu, 1973	9,100-10,100	...	13	2	7,724	28,175,876	21.5
		Shiviyacu N.E., 1977	9,100- 9,300	...	1	...	333	555,296	15.1
		Other	...	...	...	6	...	475,835	...
	OCCIDENTAL/BRIDAS	Talara Area†	...	...	603	...	19,180	133,200,000	...
	PETROPERU	Agua Caliente, 1939	1,000- 1,500	...	16	14	176	13,986,000	42.0
		Capirona, 1972	9,800-12,000	...	1	...	201	829,000	26.4
		Corrientes, 1971	10,000-12,600	10	7	7	20,227	36,126,000	25.4
		Maguia, 1957	2,100- 2,400	4	15	2	688	9,518,000	37.5
		Pavayacu, 1972	9,600-11,300	2	6	6	4,332	7,247,000	24.3
		Talara-Lima area, 1969-1905	2,000- 9,000	102	1,539	3,755	23,101	713,621,000	31.8-34.7
		Yanayacu, 1974	11,400-13,600	...	1	8	227	499,000	18.8
		Valencia 1975	10,500-11,200	...	...	2	...	178,000	44.0
		Nueva Esperanza, 1980	10,200-10,700	2	...	2	1,170	164,000	44.0
		Total Peru		**168**	**2,612**	**4,004**	**193,245**	**1,239,788,757**	
PHILIPPINES	CITIES SERVICE	• South Nido, 1977	6,660- 6,945	4	...	1	1,966	13,615,072	27.0
		• Matinloc, 1979	6,800	...	...	5	...	...	42.9
	AMOCO	• Cadlao, 1977	5,800	2	...	...	4,974	1,693,719	48.0
		Total Philippines		**6**	**...**	**6**	**6,940**	**15,308,791**	
QATAR	QGPC	• Bul Hanine, 1970	6,000	9	...	4	117,501	503,169,878	35.0
		Dukhan, 1940	6,500	87	...	21	157,727	2,086,365,298	41.1

*Daily production includes roughly 38,500 b/d of NGL. †Norway's 84.09% share of production from unitized field only. †Norway's 16.25% share of production from unitized field only.

*Former Humboldt field now subdivided into Peña Negra and Lobitos fields. †Secondary recovery project.

WORLDWIDE PRODUCTION		Name of field, discovery date	Depth, feet	Flow	No. of wells Artificial lift	Shut-in	B/d average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
		• Idd El Shargi, 1960	4,500- 8,250	15	...	19	6,027	179,727,221	35.0
		• Maydan-Mahzam, 1963	7,000	14	...	5	43,967	632,607,248	38.0
		Total Qatar		**125**	**...**	**49**	**325,222**	**3,401,869,645**	
SAUDI ARABIA	**ARAMCO**	Abqaiq, 1940	6,690	46	...	55	549,000	6,771,000,000	37.0
		Abu-Hadriya, 1940	9,340	...	...	14	29,000	520,000,000	35.0
		• Abu-Safah, 1963	6,600	18	...	6	132,000	577,000,000	30.0
		• Berri, 1964	8,300	34	...	66	392,000	2,276,000,000	32.0-34.0
		Dammam, 1938	4,800	...	...	21	9,000	588,000,000	35.0
		Fadhili, 1949	8,050	...	...	10	20,000	258,000,000	39.0
		Ghawar, 1948	6,920	192	...	673	3,772,000	24,693,000,000	34.0
		Harmaliyah, 1971	8,430	6	...	31	69,000	181,000,000	35.0
		Khurais, 1957	5,200	37	...	26	144,000	491,000,000	33.0
		Khursaniyah, 1956	6,560	13	...	19	107,000	846,000,000	31.0
		• Manifa, 1957	7,950	7	...	11	59,000	205,000,000	29.0
		• Marjan, 1967	6,800	16	...	6	90,000	144,000,000	33.0
		• Qatif, 1945	7,100	7	...	34	40,000	716,000,000	33.0-34.0
		• Safaniyah, 1951	5,100	168	...	143	1,259,000	6,422,000,000	27.0
		• Zuluf, 1965	5,800	11	...	67	420,000	1,031,000,000	32.0
		Total Saudi Arabia		**555**	**...**	**1,182**	**7,091,000**	**45,419,000,000**	
SHARJAH		• Mubarek, 1972	12,650-12,990	...	4	1	6,923	67,100,000	37.0
		Total Sharjah			**4**	**1**	**6,923**	**67,100,000**	
SPAIN	**SHELL ESPANA**	• Amposta Marino North, 1970	10,000	1	...	5	1,590	52,837,145	37.0
	CHEVRON	• Casablanca, 1975	8,500	3	...	...	13,514	14,015,706	34.0
	AMOSPAIN	Ayoluengo, 1964	4,000	...	29	6	1,471	11,414,144	37.0
	SHELL/CAMPSA	• Castellon B, 1972	9,000	1	...	...	1,017	8,685,702	35.0
	ENIEPSA	• Dorada, 1975	6,700	2	...	5	7,300	9,203,902	21.0
		Total Spain		**7**	**29**	**16**	**24,892**	**96,156,599**	
SYRIA	**S.P.C.**	Alian, 1974	5,600	5	8	...	1,400	4,600,000	13.0
		Gbebeh, 1976	2,000	4	5	1	1,000	1,500,000	19.8
		Jebisseh, 1968	2,000	12	78	11	8,000	16,500,000	19.0
		Karatchok, 1968	5,000	2	74	1	32,500	120,600,000	22.0
		Rumeilan, 1962	5,600	7	38	1	8,000	38,500,000	23.0
		Souedie, 1959	5,500	4	350	9	123,000	577,500,000	24.0
		Tichrine,1976	2,700	3	11	1	1,100	1,300,000	15.9
		Total Syria		**37**	**564**	**24**	**175,000**	**760,500,000**	
THAILAND	**UNION OIL**	Erawan[c], 1973	7,000	26	...	...	6,033	1,378,600	56.0
		Total Thailand		**26**	**...**	**...**	**6,033**	**1,378,600**	
TRINIDAD	**AMOCO**	• Teak, 1972	15,191	15	33	2	35,503	153,133,000	29.3
		• Samaan, 1972	11,780	15	26	3	25,856	135,916,000	36.8
		• Poui, 1974	11,650	20	13	1	34,304	101,699,000	34.0
	T.N.A.	• Soldado, 1955	11,000	77	211	...	37,640	390,263,887	24.8
		Fortin Offshore (FOS), 1954	...	5	7	...	210	4,204,964	...
	TRINIDAD-TESORO	Palo Seco/Erin/McKenzie, 1926	12,718	46	450	...	10,111	99,952,096	20.2
		Fyzabad, 1918	11,00-	8	325	...	3,666	162,591,535	21.5
		Coora/Quarry, 1936	14,000	5	183	...	2,143	86,890,864	23.8
		• Galeota, 1972	6,304	...	41	...	3,853	8,330,321	25.5
		Other	...	19	347	...	5,159	60,283,759	...
	TEXACO	• Brighton, 1908	700- 7,500	14	117	325	1,046	71,699,000	32.8
		Palo Seco & Erin, 1926-29	250-12,700	30	110	363	4,077	99,196,000	21.2
		Forrest Reserve, 1913	500-11,000	13	341	866	6,241	249,827,000	23.0
		Oropouche, 1944	2,700- 9,100	1	38	70	415	6,103,000	38.6
		Barrackpore, 1911	1,300-11,100	12	34	171	1,170	27,619,000	29.9-41.2
		Trinity, 1956	1,400- 9,700	...	19	22	409	14,598,000	32.2
		Guayaguayare, 1903	500-10,750	2	143	394	2,324	83,354,000	33.7
		Other	...	...	...	...	...	47,063,157	...
	TRINTOC	Area IV & Guapo, 1913	10,626	14	60	...	1,314	36,188,849	25.5
		Parrylands, 1913	10,626	31	50	...	1,336	36,843,898	30.2
		Point Fortin C & W, 1907	10,626	25	92	...	2,046	36,022,262	22.0
		Point Fortin E., 1929	11,000	8	49	...	1,027	24,713,866	22.2
		Penal, 1936	11,067	25	63	...	1,005	59,671,831	22.4
		Catshill, 1950	9,693	2	48	...	458	22,251,904	38.3
		Other	...	13	21	...	596	18,703,847	...
	P.C.O.L	All fields	...	3	80	...	306	19,491,429	...
		Total Trinidad		**285**	**2,857**	**2,217**	**181,215**	**2,056,672,469**	
TUNISIA	**ELF AQUITAINE**	• Ashtart	10,500	10	2	2	30,536	121,101,370	29.0
		Douleb/Semmama	1,500-2,500	...	11	4	1,315	15,755,200	40.0
		Tamesmida	2,500	...	3	...	317	1,448,590	36.0
	CFP	Sidi El Itayem, 1971	7,500-7,800	1	10	2	2,800	16,512,000	33.0

WORLDWIDE PRODUCTION		Name of field, discovery date	Depth, feet	No. of wells: Flow	Artificial lift	Shut-in	B d average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
		Other	...	...	...	...	...	655,000	...
	AGIP TUNISIA (Sitep)	El Borma, 1964	8,250- 8,900	43	10	...	70,330	350,752,000	42.0
		Chouech es Saida,1971	12,600	1	...	...	710	1,664,000	44.0
		Total Tunisia		**55**	**36**	**8**	**106,008**	**507,888,160**	
TURKEY	TURKSE SHELL	Barbes, 1971	7,200	...	10	2	2,551	11,824,665	29.7
		Beykan, 1964	5,200	1	19	4	4,244	51,416,581	33.2
		Kayakoy, 1960	6,000	...	14	4	3,299	15,699,425	38.2
		Kayakoy W., 1964	5,300	...	9	9	2,373	23,981,444	34.7
		Kurkan, 1963	4,500	...	18	7	3,739	41,945,121	31.4
		Malitepe, 1970	5,400	...	7	2	733	5,085,910	32.7
		Sahaban-Kurkan S., 1965	5,500	...	8	4	1,395	17,490,547	34.5
		Sincan, 1979	4,900	...	2	2	2,020	1,026,241	31.3
		Yatir Yatir-E., 1973	5,246	...	5	5	663	3,794,804	30.9
		Other	...	1	3	5	720	8,041,577	31.3
	MOBIL	Selmo, 1964	6,500	...	14	1	4,732	54,940,000	34.2
		Bulgurdagu, 1960	4,850	1	...	1	50	2,376,333	38.0
	TPAO	Raman, 1940	4,500	...	76	3	6,740	38,261,155	17.4
		Bati Raman, 1951	4,200	...	97	7	2,402	29,432,879	13.3
		Garzan-Germik, 1956	4,700- 6,500	...	19	1	1,181	33,288,421	18.8-26.2
		Magrip, 1961	5,700	...	10	4	430	13,869,056	18.4
		Silivanka, 1962	8,200	...	8	2	847	5,977,903	23.0
		Kuzey Osmancik, 1974	3,800	...	2	...	318	461,881	37.6
		Adiyaman, 1971	5,800	...	10	2	761	6,849,553	26.7
		Güney Saricak, 1973	5,250	...	5	...	382	3,010,840	31.5
		Yenikoy, 1973	6,400	...	10	1	1,683	6,188,007	31.4
		Güney Kayakoy, 1976	8,600	...	3	...	273	1,440,343	30.4
		Güney Sahaban 1978	5,450	...	5	...	481	991,968	33.2
		Güney Dincer, 1981	5,350	...	13	1	2,442	957,034	16.7
		Other	4,900-10,500	...	15	7	566	5,149,868	11.3-37.0
	ERSAN	Kahta, 1958	3,500	...	1	...	92	4,077,176	11.5
		Total Turkey		**3**	**383**	**74**	**45,117**	**387,578,437**	
UNITED KINGDOM	AMOCO	• Montrose, 1969	8,200	13	5	3	19,800	47,200,000	40.5
	BGC	Wytch Farm, 1974	2,909- 5,115	1	8	10	2,713	3,386,899	37.0-41.0
		Other	...	...	...	6	674	146,948	...
	BRITOIL*	• Thistle, 1973	9,000	29	...	...	129,662	154,273,751	38.0
		• Beatrice, 1976	6,750	20	...	...	32,940	8,465,073	39.0
	BP	• Forties, 1970	7,000	56	1	7	479,809	1,028,416,381	37.0
		• Buchan, 1974	8,692	6	...	2	29,276	12,260,166	33.0
		East Midlands, 1939	3,500	...	...	...	...	24,102,988	40.0
	CHEVRON	• Ninian, 1974	10,000	50	...	13	304,806	300,000,000	35.0
	CONOCO GROUP	• Statfjord, 1974	9,000	12	...	...	†34,871	†20,155,000	39.0
		• Murchison, 1975	9,900	13	...	2	§90,999	§43,000,000	NA
	HAMILTON BROS.	• Argyll, 1971	9,000- 9,400	6	...	...	18,970	42,512,962	38.0
	MOBIL	• Beryl, 1972	9,900-11,500	17	5	6	100,166	173,663,165	37.4
	OCCIDENTAL	• Claymore, 1974	8,100	1	17	...	94,153	135,074,330	29.5
		• Piper, 1973	8,100	20	3	...	196,356	442,928,451	37.2
	SHELL/ESSO**	• Auk, 1970	NA	10	...	...	13,369	54,696,000	37.0
		• Brent, 1971	NA	41	...	2	252,852	280,066,000	38.0
		• Cormorant, 1972	NA	5	...	...	14,581	17,496,000	36.0
		• Dunlin, 1973	NA	13	...	...	80,113	98,678,000	33.0
		• N. Cormorant,¶ 1974	NA	2	...	...	24,476	3,671,000	35.0
		• Fulmar,¶ 1975	NA	5	...	...	28,158	4,223,000	41.0
	TEXACO NORTH SEA	• Tartan, 1974	10,217-12,614	3	...	3	13,409	7,433,093	37.0-39.8
	UNION OIL	• Heather, 1973	10,800	8	9	2	37,767	28,787,000	36.0
		Total United Kingdom		**331**	**48**	**56**	**1,999,920**	**2,930,636,207**	

*Formerly BNOC. †U.K.'s 15.91% share of production from unitized field only. §U.K.'s 83.75% share of production from unitized field only. ¶Went on stream in February 1982. **Cumulative estimated.

U.S.S.R.

Field, year discovered	No. wells	1982 prod. (million bbl)	Cum prod. 1-1-83 (million bbl)	Pay, ft
Arlan, 1955	3,000	60	2,180	Carb., 4,429
Baku Archipelago, 1963	190	22	370	Pliocene, 8,773
Fedorovskoye, 1971	1,200	255	1,075	L. Cret., 5900
Kholmogorskoye, 1973	400	47	162	L. Cretaceous
Kotur-Tepe, 1956	350	33	1,043	Pliocene, 8,793
Mamontovo, 1965	1,200	204	1,184	Cretaceous, 6,300
Neftianye Kamni, 1949	1,200	23	1,022	Pliocene, 5,406
Pravdinsk, 1964	500	60	660	L. Cret., 9,580
Romashkino, 1948	8,000	380	12,380	Devonian, 5,791
Samotlor, 1965	4,200	1,120	8,935	L. Cret., 7,316
Sovetskoye, 1962	300	50	700	Cret., 11,130
Usa, 1963	800	110	520	Paleozoic, 6,510
Ust-Balyk, 1961	1,000	82	1,282	L. Cret., 8,845
Uzen, 1961	2,000	80	1,380	Jurassic, 2,667
Yuzhno-Surgut, 1973	500	80	300	L. Cret.
Zapadno-Surgut, 1962	250	30	450	Cret., 7,628

WORLDWIDE PRODUCTION		Name of field, discovery date	Depth, feet	No. of wells Flow	Artificial lift	Shut-in	B'd average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
VENEZUELA	**PDV ANZOA-TEGUI**	Boca, 1971	9,500	5	9	57	805	74,440,022	33.0
		Caico Seco, 1946	6,500- 7,300	16	15	62	4,248	61,042,993	37.3
		Chimire, 1948-52	7,000- 7,200	3	9	177	3,990	361,145,592	36.0
		Dacion, 1957	6,700	3	103	41	11,915	206,128,892	21.3
		Elias, 1954	5,000- 6,470	27	36	81	1,290	105,693,227	36.6
		El Roble, 1939	3,500-11,500	10	1	39	1,099	39,149,860	51.3
		Guico, 1944	4,500- 7,000	1	2	68	188	86,592,972	25.4
		Guara, 1946	5,000-10,000	21	145	211	13,101	543,405,566	26.0
		Inca, 1948	7,250	6	16	25	275	28,635,025	32.9
		Leona, 1938	2,200-12,800	14	149	123	12,990	175,751,975	21.4
		La Ceiba, 1946	9,450	14	6	15	5,472	43,493,827	33.8
		Mata, 1954	8,970-10,516	28	15	352	8,263	448,724,857	34.1
		Merey, 1937	5,400- 5,700	6	317	64	16,198	226,904,189	11.4
		Nipa, 1945	6,000- 8,500	37	90	342	15,479	483,788,678	29.5
		Oscurote-Norte, 1952	9,513	5	20	59	2,362	118,230,905	22.1
		Oficina, 1937	5,900	41	261	186	22,238	745,108,892	21.6
		Soto, 1950	9,500	24	23	154	6,711	175,011,936	38.9
		Sta. Ana, 1936	8,500	60	4	45	7,957	54,597,338	44.3
		San Joaquin, 1939	6,550	34	1	34	2,612	42,257,644	53.2
		Sta. Rosa, 1941	8,500	108	18	75	16,160	272,962,986	48.4
		Yopales, 1937	4,600	28	113	87	14,188	133,328,589	22.2
		Zanjas, 1958	13,270	8	1	8	3,552	31,638,084	35.4
		Zapatos, 1955	11,500	25	7	39	6,712	135,182,822	37.0
		Zorro, 1953	11,100	7	8	13	3,085	66,925,648	28.3
		Zulus, 1957	12,710	10	1	14	1,708	21,083,334	39.8
		Zumo, 1954	9,200	4	25	20	156	66,401,897	17.9
		La Ceibita, 1963	9,878	16	3	26	3,652	74,520,947	41.3
		Adjuntas, 1957	5,000	1	41	10	1,400	9,686,047	13.9
		Other	...	65	87	541	13,623	380,826,244	...
	MONAGAS	Acema, 1960	...	38	8	66	23,563	65,772,106	23.9
		Aguasay, 1955	8,100-13,400	12	3	41	1,525	104,833,356	41.7
		Jobo, 1956	3,600- 4,000	1	190	195	42,978	183,349,978	12.0
		Morichal, 1958	3,312	...	56	153	11,595	157,034,273	10.6
		Orocual, 1953	2,954	11	8	21	432	22,523,780	27.0
		Oritupano, 1950	7,657	37	67	99	11,114	162,630,440	22.8
		Pirital, 1958	450- 1,100	...	47	35	853	24,558,631	17.0
		Quiriquire, 1928	7,000- 7,200	...	258	209	7,891	752,137,630	16.3
		Sta. Barbara, 1941	5,020- 6,500	11	50	253	1,949	164,072,005	29.8
		Tacat, 1953	1,820- 3,670	...	43	88	273	43,151,198	17.0
		Temblador, 1936	3,500- 4,500	...	15	33	1,488	106,414,774	19.2
		Other	...	20	64	513	19,140	786,106,047	...
	ZULIA	Barua, 1928	...	1	2	9	1,051	17,437,596	20.8
		Boscan, 1946	...	...	268	136	57,588	630,533,524	10.2
		Bachaquero, 1930	...	77	2,496	1,013	230,860	5,831,017,151	20.2
		Cruces-Manueles, 1916	3,000- 8,000	4	53	73	1,797	172,673,584	30.9
		Cabimas, 1917	2,200	91	701	381	71,659	1,485,987,661	23.4
		Centro, 1959	9,600-11,000	61	88	47	80,498	648,173,715	35.6
		La Concepcion, 1953	3,148- 8,000	3	64	99	4,356	128,715,002	35.1
		La Paz, 1925	4,268- 8,000	10	62	80	16,513	827,565,012	30.5
		Lago, 1959	11,450	30	7	26	18,593	199,381,440	31.7
		Lagunillas, 1926	3,000	689	2,701	1,411	391,254	9,946,111,669	21.5
		Lama, 1937	8,320	146	88	123	117,315	2,288,675,690	32.8
		Lamar, 1958	13,000	48	73	41	60,022	976,984,117	34.5
		Mara, 1945	5,240	10	41	53	7,323	397,745,189	22.0
		Mene Grande, 1914	4,130	2	286	297	12,079	616,803,092	18.4
		Motatan, 1952	...	12	7	8	6,132	40,400,574	20.3
		Sibucana, 1948	13,450	...	...	...	701	42,238,372	32.2
		Tia Juana, 1928	3,000	120	2,116	450	208,077	3,529,583,709	17.9
		Urdaneta, 1970	10,000	7	11	51	9,773	292,456,076	23.3
		West-Tarra, 1942	4,250- 5,500	7	11	23	2,131	68,091,136	41.3
		Other	...	37	72	115	16,532	360,501,490	...
	BARINAS	Hato, 1965	9,550	1	14	1	2,852	38,288,164	27.3
		Maporal, 1957	10,950	...	5	2	1,037	10,174,179	28.9
		Paez, 1963	...	1	34	10	8,154	41,633,658	20.2
		Silvan, 1949	10,860	2	12	...	1,954	42,388,208	29.3
		Silvestre, 1948	8,860	9	166	87	4,873	127,397,943	25.3
		Sinco, 1953	8,500- 9,100	1	45	33	9,276	238,568,988	24.0
		Other	...	2	2	5	407	4,192,856	...
	FALCON	All fields	...	...	16	144	319	107,652,537	...
	GUARICO	Budare, 1958	4,523	9	10	17	5,185	60,676,097	31.5
		Las Mercedes, 1942	4,500	2	30	152	619	132,164,536	28.8
		Ruiz, 1949	4,500	...	16	26	502	32,640,603	32.0
		Other	...	10	71	229	1,998	365,445,958	...
	AMACURO	Tucupita	...	25	4	38	1,153	50,170,087	16.6
		Total Venezuela		**2,139**	**11,890**	**9,654**	**1,676,816**	**37,537,714,819**	

WORLDWIDE PRODUCTION		Name of field, discovery date	Depth, feet	Flow	No. of wells Artificial lift	Shut-in	B/d average, first 6 mo. 1982	Cumulative, bbl, to July 1, 1982	°API gravity
WEST GERMANY	**BAVARIA**	Arlesried, 1964	4,900			...	1,141	11,571,627	47.0
		Moenchsrot, 1958	4,800		104	...	405	10,876,358	36.0
		Other	...			...	3,829	29,198,295	...
	EMSLAND	Emlichheim, 1964	2,600			..	2,823	37,728,679	25.0
		Georgsdorf, 1944	1,800- 2,600			...	7,065	88,777,681	24.0-29.0
		Meppen-Schwefingen, 1960	4,000		1,098	...	1,144	10,269,811	28.0-30.0
		Ruehlermoor, 1949	2,000- 4,700			...	11,107	119,947,104	28.0-30.0
		Ruehlertwist, 1949	2,350- 2,900			...	1,896	27,811,024	25.0
		Scheerhorn, 1949	3,550- 3,750			...	3,325	44,736,591	30.0
		Other	...			...	1,635	27,793,305	...
	SCHLESWIG-HOLSTEIN	Ploen-Ost, 1959	6,400			...	2,345	46,007,125	36.0
		Preetz, 1962	8,350- 8,550		221	...	472	10,067,733	29.0
		Reitbrook, 1937	1,450- 2,100			...	1,041	36,024,776	29.0
		Other	...			...	3,786	48,333,529	...
	HANOVER	Eldingen, 1949	4,750			...	1,000	17,586,513	35.0
		Hankensbuettel, 1954	4,450- 5,100			...	5,797	83,658,474	33.0
		Hardesse, 1958	4,300- 5,900			...	838	7,959,973	34.0
		Hohne, 1958	4,300- 5,900			...	958	37,216,456	33.0-34.0
		Knesebeck, 1958	5,100- 5,200			...	1,466	15,607,556	36.0
		Leiferde, 1956	2,600		828	..	675	19,136,032	34.0
		Lueben, 1955	3,950			...	897	9,989,339	35.0-38.0
		Meckelfeld, 1938	1,000- 1,300			...	541	13,405,558	24.0-32.0
		Oelheim-Sued, 1968	7,650			...	739	5,942,585	33.0
		Orrel-Wesendorf-Nord, 1954	4,450			...	947	10,759,212	...
		Ruehme, 1954	1,950			...	792	8,298,837	...
		Sinstorf, 1960	6,750- 7,150			...	936	17,120,494	...
		Suderbruch, 1949	3,750- 7,550			...	795	21,522,148	19.0-38.0
		Vorhop, 1952	2,950- 6,900			...	1,049	14,531,289	36.0
		Other	...			...	3,601	217,949,557	...
	UPPER RHINE VALLEY	Landau, 1955	3,950-4,800			...	1,386	22,627,493	36.0
		Other	...		112	...	264	11,767,364	...
	WESER-EMS	Barenburg, 1953	2,300- 3,300			...	2,671	31,775,789	29.0
		Bolkstedt, 1954	3,750			...	1,319	17,998,878	...
		Bramberge, 1958	2,560- 3,300			...	7,353	82,983,099	29.0
		Dueste, 1954	2,600- 4,250			...	1,688	37,831,865	...
		Gross Lessen, 1969	3,300		714	...	1,882	19,201,737	...
		Sued-Oldenburg, 1950	1,700- 6,500			...	1,441	36,333,796	...
		Voigtei, 1953	1,150- 1,500			...	1,024	22,618,550	31.0-34.0
		Wehrbleck, 1947	3,400			...	970	14,246,504	33.0
		Other	...			...	2,194	28,322,530	...
		Total West Germany			**3,077**	**...**	**85,237**	**1,375,535,266**	
ZAIRE	**GULF OIL**	• GCO, 1970	7,000- 9,000	3	...	5	743	5,084,023	29.0
		• Mibale, 1973	5,000- 6,000	...	6	1	20,418	43,933,252	30.0
		• Mwambe, 1979	6,150	...	...	2	18	300,138	30.4
		• Motoba, 1976	11,098	1	...	..	319	91,862	44.3
		Total Zaire		**4**	**6**	**8**	**21,498**	**49,409,275**	

UNITED STATES

State	Field	Disc. date	1,000 bbl 1982 prod.	1,000 bbl Cum. prod. 1-1-83	1,000 bbl Est. rem. reserves	Est. No. wells
ALABAMA						
	Citronelle	1955	2,099	135,099	18,711	446
ALASKA*						
	Granite Point	1965	3,440	90,967	27,798	32
	Kuparuk	1971	32,672	33,572	1,200,000	75
	McArthur River	1965	15,946	473,788	49,317	68
	Middle Ground Shoal	1963	3,538	137,302	21,313	38
	Prudhoe Bay	1968	560,665†	2,666,718	6,760,802	320
	Swanson River	1968	2,721	195,267	18,475	47
ARKANSAS						
	Smackover	1922	3,420	535,420	14,580	2,160
CALIFORNIA						
SAN JOAQUIN VALLEY						
	Belridge South	1911	35,634	346,520	384,366	4,072
	Buena Vista	1910	2,144	638,649	17,996	1,141
	Coalinga	1938	8,995	691,799	62,005	2,107
	Coalinga Nose	1952	1,846	453,444	17,937	76
	Coles Levee North	1938	1,070	156,838	9,917	101
	Cuyama South	1949	585	214,803	2,043	137

*Base data adjusted from last year's report to correspond with Alaska Oil & Gas Conservation Commission's final 1981 production report. †Includes about 11 million bbl of condensate.

State	Field	Disc. date	1,000 bbl 1982 prod.	Cum. prod. 1-1-83	Est. rem. reserves	Est. No. wells
	Cymric	1916	4,540	160,542	29,460	851
	Edison	1928	1,585	125,448	7,415	821
	Elk Hills	1919	59,788	633,587	782,973	1,161
	Fruitvale	1928	1,046	109,985	8,892	414
	Greeley	1936	260	111,129	1,485	37
	Kern Front	1915	2,593	159,632	23,407	1,049
	Kern River	1899	44,607	918,368	872,548	5,206
	Kettleman North Dome	1931	230	455,147	1,505	62
	Lost Hills	1910	6,440	146,614	16,060	1,591
	McKittrick	1887	4,855	244,770	24,918	1,204
	Midway-Sunset	1912	45,680	1,553,813	423,320	8,287
	Mount Poso	1926	8,742	219,547	48,258	512
	Rio Bravo	1944	420	114,665	902	19
COASTAL AREA						
	Cat Canyon East & West	1944	4,881	219,484	34,777	745
	Dos Cuadras	1969	6,903	180,459	41,079	139
	Elwood	1928	147	103,898	298	10
	Hondo	1969	13,452	21,318	**	15
	Orcutt	1902	1,196	159,584	16,528	186
	Rincon	1927	1,559	139,953	12,533	276
	San Ardo	1947	9,430	367,643	147,633	718
	Santa Maria Valley	1934	3,052	84,208	39,648	205
	South Mountain	1916	1,049	140,864	9,845	396
	Ventura	1916	7,333	863,627	46,446	631
	Point Arguello Hueso	1981††	—	—	—	—

**Hondo reserves identified thus far are pegged at about 94 million bbl of oil, but western portion of field and the other two fields in the Santa Ynez unit, Sacate and Pescado, are yet to be developed. Combined potential reserves of the unit are pegged at about 400 million bbl of oil. ††Definite giant structure tapped by these two discoveries, although much more delineation is needed to assess potential reserves. Unofficial preliminary estimates peg reserves of as much as 500 million bbl or more.

State	Field	Disc. date	1,000 bbl 1982 prod.	Cum. prod. 1-1-83	Est. rem. reserves	Est. No. wells
LOS ANGELES BASIN						
	Beta	1976	3,097	4,466	**	32
	Beverly Hills	1967	3,147	106,425	24,453	119
	Brea Olinda	1884	2,818	369,292	16,270	741
	Coyote East	1911	716	104,832	5,537	127
	Coyote West	1909	1,089	244,265	6,772	141
	Dominguez	1923	731	265,241	7,576	114
	Huntington Beach	1920	10,145	1,021,103	57,826	970
	Inglewood	1924	3,751	325,756	30,649	424
	Long Beach	1921	3,452	903,106	34,048	501
	Montebello	1927	482	189,099	3,930	155
	Richfield	1919	1,586	178,781	12,731	233
	Santa Fe Springs	1919	928	607,000	11,672	175
	Seal Beach	1924	577	196,100	7,279	167
	Torrance	1922	2,411	200,666	13,554	377
	Wilmington	1932	38,617	2,072,199	328,588	2,192

**At least 196 million bbl of oil reserves have been identified thus far in Beta field. Further development planned, with ultimate recovery pegged at as much as 300 million bbl of oil.

COLORADO*

	Rangely	1933	15,300	664,261	59,340	506

FLORIDA

	Jay	1970	17,304	314,326	77,696	106

ILLINOIS*

	Clay City	1938	3,600	333,600	9,000	2,604
	Lawrence	1906	2,100	28,300	6,500	2,721
	Louden	1938	1,600	378,520	6,400	1,332
	Main	1906	1,700	16,700	4,000	3,696
	New Harmony	1939	1,500	146,400	3,400	1,136
	Salem	1938	114	371,940	4,000	1,286

KANSAS*

	Bemis-Shutts	1928	1,700	230,596	4,831	903
	Chase-Silica	1931	1,260	259,209	5,798	1,024
	Eldorado	1917	1,100	288,653	3,791	810
	Hall-Gurney	1931	1,270	138,250	5,471	1,087
	Trapp	1937	1,462	218,440	5,014	916

LOUISIANA

Onshore South						
	Bay de Chene	1941	841	93,841	21,154	51
	Bay St. Elaine	1928	1,011	162,311	27,789	56
	Bayou Sale	1941	935	156,735	8,275	29
	Black Bay, West	1953	4,027	131,027	23,973	101
	Caillou Island	1930	4,680	588,780	91,220	183
	Cote Blanche Bay, West	1940	1,620	179,020	50,980	177
	Delta Farms	1944	1,177	57,779	8,597	53
	Garden Island Bay	1934	2,476	212,276	42,724	183
	Golden Meadow	1938	1,152	130,460	9,548	225
	Grand Bay	1938	1,114	167,298	7,886	97
	East Hackberry	1927	1,400	106,269	13,448	80
	West Hackberry	1928	1,600	131,465	18,111	130
	Jennings	1901	300	113,500	2,755	70
	Lafitte	1935	2,700	243,900	21,100	210
	Lake Barre	1929	1,944	197,944	27,156	65
	Lake Pelto	1929	737	114,137	20,863	41
	Lake Washington	1931	2,592	228,512	31,408	104
	Leeville	1931	815	139,115	10,985	47
	Paradis	1939	732	121,432	13,518	32
	Quarantine Bay	1937	2,157	167,057	7,943	87
	Timbalier Bay, Onshore	1938	2,454	269,654	31,046	118
	Venice	1937	1,516	176,816	13,284	73
	Vinton	1910	800	134,000	2,755	130
	Weeks Island	1945	1,274	222,724	27,326	48
	West Bay	1940	3,084	216,784	27,916	164
NORTH						
	Caddo-Pine Island	1905	3,468	332,972	15,000	8,779
	Delhi	1944	2,832	207,745	42,255	118
	Haynesville	1921	2,844	185,611	5,156	327
Offshore						
	Bay Marchand Blk. 2	1949	6,316	556,416	94,184	148
	Grande Isle Blk. 16	1948	1,314	251,014	99,674	57
	South Pass Blk. 24	1950 (Includes onshore)	6,000	431,097	47,220	423
	South Pass Blk. 27	1954	1,616	300,360	87,119	235
	South Pass Blk. 61	1968	8,632	88,632	86,368	123
	South Pass Blk. 62	1965	2,757	87,598	100,364	81
	South Pass Blk. 65	1969	1,894	84,279	105,848	56
	Eugene Island Blk. 330	1971	6,964	207,848	117,152	187
	Grand Isle Blk. 43	1956	4,544	235,544	122,156	220
	Main Pass Blk. 41	1957	2,200	189,902	90,302	110
	Main Pass Blk. 306	1969	4,302	65,005	84,995	98
	Miss. Canyon Blk. 194	1980	6,507	18,101	88,493	11
	Ship Shoal Blk. 204	1968	1,716	56,710	48,290	58
	Ship Shoal Blk. 207	1967	1,692	78,329	48,410	61
	Ship Shoal Blk. 208	1962	2,484	135,250	90,193	93
	South Timbalier Blk. 21	1939	2,207	198,403	64,240	91
	South Timbalier Blk. 135	1956	770	131,926	33,074	59
	West Delta Blk. 30	1949	5,870	394,754	56,347	176
	West Delta Blk. 73	1962	2,335	168,248	106,742	85

MICHIGAN

	Pigeon River	1970	587	4,925	144,413	11

MISSISSIPPI

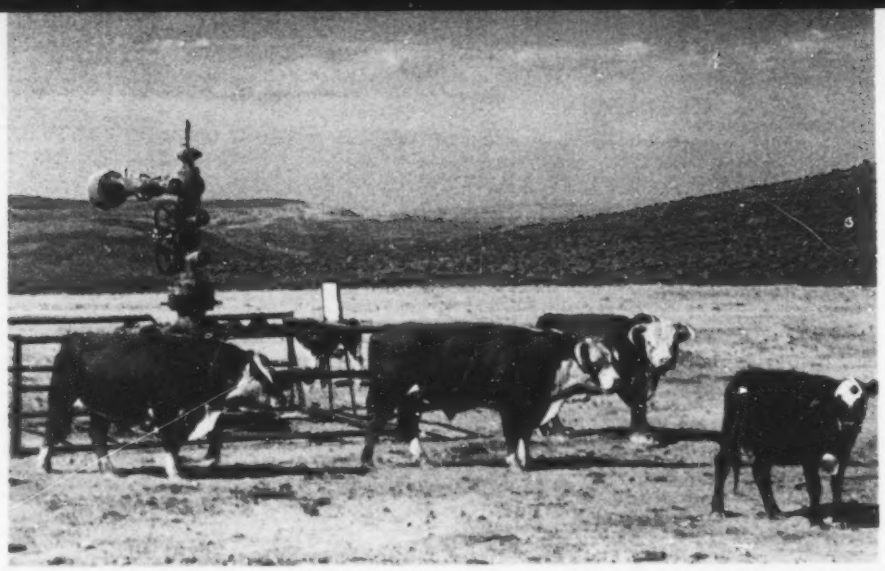
	Baxterville	1944	5,868	214,325	25,000	298
	Heidelberg	1944	3,855	149,455	22,145	294
	Tinsley	1939	1,246	212,773	7,254	186

MONTANA*

	Bell Creek	1967	3,000	119,600	33,000	178
	Cut Bank	1926	1,200	152,400	43,440	736
	Pine	1951	1,900	95,600	15,100	78

NEW MEXICO

	Denton	1949	912	134,216	5,786	130



AMOCO'S Whitney Canyon N. 2 deep discovery opened a mahor new drilling play in deep Paleozoic rocks. Herford cattle sun themselves near the deep Wyoming well.

State Field	Disc. date	1982 prod.	1,000 bbl Cum. prod. 1-1-83	Est. rem. reserves	Est. No. wells
Empire Abo	1957	3,720	207,284	62,716	190
Eunice-Monument	1929	3,456	156,768	18,260	1,000
Hobbs	1928	3,996	255,430	32,004	410
Maljamar	1926	2,448	132,579	17,452	760
Vacuum	1929	18,732	377,332	28,268	1,090
NORTH DAKOTA*					
Beaver Lodge	1951	2,400	100,621	19,930	154
Billings Nose:					
Four Eyes	1978	446	3,800		13
Big Stik	1979	6,800	20,500	72,972	57
T-R	1978	1,900	6,400		62
Little Knife	1977	5,100	24,750	78,100	136
Mondak	1976	1,550	8,900	89,770	190
OKLAHOMA*					
Burbank	1920	2,268	524,652	17,752	1,047
Eola-Robberson	1947	1,400	125,685	14,316	585
Fitts	1933	3,500	175,158	13,084	625
Glenn Pool	1905	1,067	321,265	8,735	1,101
Golden Trend	1945	3,800	430,656	33,371	1,196
Healdton	1913	2,260	329,196	20,696	1,417
Hewitt	1919	3,285	257,352	28,867	1,279
Oklahoma City	1928	796	739,613	9,156	204
Postle	1960	1,927	96,580	23,252	316
Sho-Vel-Tum	1914	19,868	NA	124,998	8,708
Sooner Trend	1965	8,600	252,342	42,757	5,156
TEXAS					
District 2					
Greta	1933	1,440	141,440	18,660	199
Lake Pasture	1953	2,436	68,864	26,564	181
Tom O'Connor	1934	17,580	658,580	142,420	803
West Ranch	1938	4,344	358,944	19,056	420
District 3					
Anahuac	1935	1,848	274,848	25,152	140
Conroe	1931	9,000	688,003	62,000	360
Giddings	1971	31,000	156,000	269,000	2,107
Hastings	1934	6,000	669,000	101,000	278
Magnet Withers	1936	1,872	98,672	8,128	190
Oyster Bayou	1941	1,836	153,136	25,164	49
Thompson	1931	5,484	444,184	55,716	297
Tomball	1933	1,200	117,400	12,600	158
Webster	1937	5,676	539,676	109,824	144
District 5					
Van	1928	5,676	499,676	50,524	440
District 6					
East Texas	1930	53,000	5,178,988	1,267,688	11,453
Fairway	1960	3,384	172,584	37,616	94
Hawkins	1940	11,772	752,772	105,000	424
Neches	1953	2,688	91,388	18,512	147
Quitman	1948	5,160	109,160	6,140	434
District 8					
Andector	1946	3,228	165,028	19,872	102
Block 31	1945	5,364	192,164	28,936	232
Cowden, N.	1930	14,412	401,512	48,488	1,252
Cowden, S., Foster, Johnson	1932	12,360	435,360	49,740	1,708
Dollarhide	1945	2,460	178,960	21,540	160
Dune	1938	3,564	162,564	17,900	675
Fullerton	1942	7,320	301,320	30,680	749
Goldsmith	1934	10,000	703,300	80,000	2,400
Howard Glasscock	1925	6,072	366,072	41,028	2,269
Iatan, E.	1926	3,768	120,768	19,232	1,219
Jordan	1937	1,344	121,944	9,256	365
Keystone	1930	2,436	299,436	19,564	1,068
McElroy	1926	10,236	413,241	99,000	1,025
Means	1934	4,368	191,518	31,632	476
Midland Farms	1944	4,248	214,248	26,252	338
Sand Hills	1931	3,552	223,752	22,548	1,268
TXL	1944	1,452	253,352	11,328	478
Waddell	1927	1,176	95,276	9,724	197
Ward Estes, N.	1927	3,192	340,192	24,808	424
Yates	1926	46,512	920,694	1,033,811	611
District 8-A					
Anton-Irish	1944	6,192	146,292	53,808	245
Cogdell Area	1949	2,868	255,000	54,232	137
Diamond M	1948	2,652	224,790	31,548	521
Kelly-Snyder	1948	23,508	1,127,930	222,070	855
Levelland	1938	19,536	374,236	80,000	2,389
Prentice	1951	3,792	130,892	28,708	327
Salt Creek	1950	3,792	200,192	59,708	134
Seminole	1936	29,196	429,196	90,000	466
Slaughter	1936	27,012	891,212	108,688	2,867
Spraberry Trend	1951	16,932	517,932	75,000	5,886
Wasson	1936	47,700	1,498,214	175,000	2,149
Welch	1942	3,420	122,420	25,580	517
District 10					
Panhandle	1921	9,732	1,364,258	80,268	11,389
UTAH*					
Altamont-Bluebell	1955	6,200	140,600	253,100	352
Greater Aneth	1956	5,300	318,475	50,000	482
Greater Red Wash	1951	1,900	114,800	22,100	210
East Anschutz Ranch (condensate)	1979	—	657	800,000	7
Pineview	1975	1,300	21,600	123,600	31
WYOMING*					
Brady	1960	3,500	35,600	67,900	7
Byron	1918	2,050	109,900	17,950	56
Elk Basin (Wyo-Mont)	1915	4,600	521,900	45,400	258
Garland	1906	2,400	138,050	9,600	233
Grass Creek	1914	2,800	169,400	23,700	285
Hamilton Dome	1918	3,000	249,000	13,800	264
Hartzog Draw	1976	2,500	34,200	314,500	130
Hilight	1969	1,600	71,400	60,100	120
Lance Creek	1918	200	107,000	600	52
Lost Soldier	1916	3,400	175,270	17,800	82
Oregon Basin	1912	8,100	330,100	71,900	459
Painter Reservoir	1979	3,500	12,500	111,500	36
Salt Creek	1906	5,400	595,600	24,100	1,146
Whitney Canyon-Carter Creek	1980	404	45	115,000	3

*Production data furnished by Petroleum Information, Denver. Reserve data by Oil & Gas Journal.

Giant reserves

Many of the world's giant oil fields, particularly those in the United States, were found in the 1920-1949 period of time. The advent of World War II forced the explorationists of the U.S. and its allies into a fast paced search for hydrocarbons. A multitude of major oil fields were discovered in Texas, Oklahoma, Louisiana, California, and the Rockies. After the war, the search for oil continued to expand throughout the North American continent. But, at the same time, the industry was uncovering vast reserves of oil in other parts of the world. The following list shows what has been found since 1950.

Giant oil fields found since 1950

		Million bbl						
	Number of wells	1981 prod.	Cumulative 1-1-81	Estimated remaining reserves	Pay ft.	API° gravity	Geologic province	Type of trap
Safaniyah, Saudi Arabia, 1951	208	563	6,188	12,673	Cretaceous, 5,100	27.0	Arabian platform	Anticline
Samotorskoye, U.S.S.R., 1965	3,300	1,100	7,790	7,690	L. Cret., 7,316	35.0	West Siberian basin	Anticline
Rumaila, Iraq, 1953	30	300	3,970	9,905	Zubair, 10,800	35.0	Arabian platform	Anticline
Prudhoe Bay, U.S., 1968	261	555	2,104	7,324	Triassic, 8,210	26.0	North Slope	Anticline
Manifa, Saudi, Arabia, 1957	6	18	193	8,529	Arab, 7,950	28.0	Arabian platform	Anticline
Marun, Iran, 1963	—	—	3,295 ('77)	7,592 ('77)	Asmari, 11,000	32.9	Iranian basin	Anticline
Ahwaz Asmari, Iran, 1958	—	—	2,081 ('77)	7,049 ('77)	Asmari, 8,700	31.9	Iranian basin	Anticline
Bibi Hakimeh, Iran, 1961	—	—	2,110 ('77)	6,840 ('77)	Asmari, 5,400	29.7	Iranian basin	Anticline
Berri, Saudi Arabia, 1964	37	184	2,209	5,664	Arab, 7,450	33-38.0	Arabian platform	Anticline
Raudhatain, Kuwait, 1955	38	—	1,658 ('77)	6,042 ('77)	Zubair, 8,500	34.8	Arabian platform	Anticline
Mexico (all fields, including old ones)	3,593	873	8,768	56,990	—	—	—	—
Zulut, Saudi, Arabia, 1965	40	240	947	4,304	5,800	32.0	Arabian platform	Anticline
Khafji, D.Z., 1961	104	89	1,889	4,727	"A," 4,300-12,000	28.4	Arabian platform	Anticline
Hassi Messaoud, N., Algeria, 1956	108	172	116	3,915	Cambrian 11,000	49.0	Erg Oriental	Faulted anticline
Uzen, U.S.S.R., 1961	2,000	90	1,430	4,050	Jurassic, 2,667	33.9	Mangyshlak basin	Anticline
Khurais, Saudi Arabia, 1957	33	25	152	4,181	5,200	33.0	Arabian platform	Anticline
Statfjord, Norway, 1974	8	45	68	3,720	Jurasaic	39.0	North Sea Basin	Anticline
Abu-Safah, Saudi Arabia, 1963	17	46	551	3,553	Arab, 6,650	30.0	Arabian platform	Atnicline
Amal, Libya, 1959	66	22	696	3,613	Cambro-Ord., 9,900	37.5	Sirte basin	Intra-cratonic uplift
Marjan, Saudi Arabia, 1967	10	26	130	1,174	6,800	33.0	Arabian platform	Anticline
Zakum, Abu Dhabi, 1964	59	86	1,197	968	9,100	39.0	Arabian platform	Anticline over deepseated salt uplift
Ninian, U.K., 1974	33	107	248	1,200	Jurassic 10,000	35.0	North Sea	Horst block
Bu Hasa, Abu Dhabi, 1962	43	93	2,238	800	7,500-8,000	40.0	Arabian platform	Reef on anticline
Intisar "A", Libya, 1967	8	14	661	1,075	"A," 9,750	45.0	Sirte basin	Reef
Intisar "D", Libya, 1967	16	22	920	1,800	"D," 9,400	39.0	Sirte basin	Reef
Sassan, Iran, 1966	—	—	469 ('77)	1,037 ('77)	Arab, 7,500-8,100	34.0	Arabian platform	Anticline
Malongq, Cabinda, 1966	22	22	421	1,005	Cret. 1,500-8,500	22.5 -29.6	Angola basin	—

	Million bbl							
	Number of wells	1981 prod.	Cumulative 1-1-81	Estimated remaining reserves	Pay ft.	API° gravity	Geologic province	Type of trap
Ramadan, Egypt, 1974	12	35	210	1,000	L. Cret., 11,300	31.7	Gulf of Suez graben	Faulted anticline
Darius, Iran, 1961	—	—	396 ('77)	955 ('77)	Yamama, 11,000	34.0	Arabian platform	Anticline
Novo-Elkhouskoye, U.S.S.R., 1951	1,500	55	1,610	925	Paleozoic, 5,577	32.0	—	—
Swan Hills, Canada, 1957	723	23	567	798	Beaverhill Lake 8,100	40.0	Alberta basin	Reef
Pembina, Canada, 1953	3,398	28	1,016	760	Cret., 3,200-5,100	32-37.0	Alberta basin	Permeability
RosTam, Iran, 1966	—	—	89 '(77)	917 '(77)	Asmari, 9,800	Iranian basin	Anticline	
Umm Gudair, Kuwait, 1963	24	—	134 ('77)	866 ('77)	9,300	26.7	Arabian platform	Anticline
E. Anschutz Ranch, U.S., 1979	7	.7	.7	800	Nugget, 12,000-15,572	52.0	Overthrust Belt	Baulted anticline
Ampa, SW, Brunei, 1963	—	—	761 ('77)	648 ('77)	Asmari,	33.9	Iranian basin	Anticline
Mata, Venezuela, 1954	51	3	487	638	Oficina 8,970-10,516	34.1	Maracaibo basin	Anticline
Intisar "B,"	2	.5	5	638	"B" 9,400	39.5	Sirte basin	Reef
Pazanan, Iran, 1961	—	—	164 ('77)	3,354 ('77)	Asmari,	37.2	Iranian basin	Anticline
Gialo, Libya, 1961	206	63	1,717	2,600	Eocene, 2,200-6,300		Sirte basin	Anticline
Wafra, D.Z., 1953	279	37	1,159	2,512	1,100-8,900	18.9-25.0	Arabian platform	Anticline
Paris, Iran, 1964	20	—	—812 ('77)	2,247 ('77)	Yamana et al. Asmari, 4,670	38.8	Iranian basin	Anticline
Lama, Venezuela, 1957	178	49	2,272	2,000	TerTiary, 8,320	32.8	Maracaibo basin	Faulted anticline
Messla, Libya, 1971	—	36 ('78)	45 ('78)	3,000	Sarir, 8,768	40.0	Sirte basin	Strat Traps
Rag-e-Safid, Iran, 1964					'Asmari, 7,230	28.6	Iranian basin	Anticline
Brent, U.K., 1971	22	78	234	1,800	Jurassic	38.0	North Sea basin	Anticline
Arlon, U.S.S.R., 1955	3,000	90	2,370	1,725	Carb.,	27.2	Volga-Ural basin	Anticline
Ust-Balyk, U.S.S.R., 1961	1,000	85	1,290	1,707	L. Cret., 8,845	29.0	West Siberian basin	Anticline
Forties, U.K., 1970	50	173	855	1,600	Paleocene, 8,000	37.0	North Sea basin	Anticline
Idd El Shargi, Qatar, 1960	16	4	179	1,942	Arab, Fadhili, 4,500-8,250	35.0	Arabian platform	Anticline
Minagish, Kuwait, 1952	9	—	224 ('77)	1,776 ('77)	10,000	34.2	Arabian platform	Anticline
Khursaniyah, Saudi Arabia, 1956	23	65	829	1,511	Arab, 6,560	31.0	Arabian platform	Anticline
Umm Shaif, Abu Dhabi, 1958	56	93	1,096	1,600	8,500	37.0	Arabian platform	Deep-seated salt uplift
Mamontovo, U.S.S.R., 1965	700	125	900	852	Cret., 6,300	27.0	West Siberian basin	Anticline
Ekofisk, Norway, 1970	22	34	82	1,200	Danian, 10,000	41.1	North Sea Basin	Anticline
Sovetskoye, U.S.S.R., 1962	300	50	650	1,100	Cret., 11,130	34.0	West Siberian basin	Anticline
Nafoora-Augila, Libya, 1965	39	20	749	631	Eocene 2,200-10,000	35.5	Sirte basin	Reef
Pravdinsk, USSR, 1964	500	60	600	704	L. Cret., 9,580	35.0	Siberian basin	Anticline
Fateh, Dubai, 1966	47	56	648	7,900-	9,000	31.8	Arabian platform	Anticline
Piper, U.K., 1973	18	73	405	618	Piper 8,100	37.2	North Sea	Graben
Kotor-Tepe, USSR, 1956	350	50	1,030	590	Pliocene, 6,793	29-44.0	S. Caspian trough	Faulted anticline
Mayden-Mahzan, Qatar, 1963	16	34	634	565	Arab, 7,200	38.0	Arabian platform	Anticline
Fahud-Naith, Oman, 1964	97	22	604	575	Thamama 2,000-6,080	33.3	Oman platform	Faulted anticline
Lamar,Venezuela, 1958	119	31	967	498	Tertiary 13,000	34.5	Maracaibo basin	Anticline
Kingfish, Australia, 1967	27	50	786	459	Latrobe Valley 7,500	46.9	Grippsland basin	Faulted anticline
Zarzaitaine, Algeria, 1958	—	15	14	456	Devonian, 4,700	42.2	Polignac basin	Faulted Anticline
Coalinga Nose, U.S. 1952	74	2	452	20	Vaqueros 6,445	37.0	San Joaquin Valley	—
Dos Cuadras, US, 1969	146	7	174	48	—	37.0	Offshore	—
BeTa, 1976, US	11	1	1	300	—	—	Offshore	—
Beverly Hills, SUS, 1967	106	3	103	28	Miocene, 7,416	28.0	Los Angeles basin	—
Jay, USt 1970	106	24	297	95	Jurassic 15,470	54.0	Salt basin	Strat trap

	Million bbl							
	Number of wells	1981 prod.	Cumulative 1-1-81	Estimated remaining reserves	Pay ft.	API° gravity	Geologic province	Type of trap
South Pass 24, US, 1950	423	7	425	53	Miocene, 6,530+	30.0	Gulf Coast basin	—
South Pass 27, US, 1954	235	3	299	89	Miocene, 6,500+	26.0	Gulf Coast basin	—
Eugene Island 330, US 1971	187	16	201	124	Pliocene, 5,685	26.0	Gulf Coast basin	Anticline
Grand Isle 43, US, 1956	220	7	231	127	Miocene, 7,800+	32.0	Gulf Coast basin	—
Main Pass 41, US, 1957	110	4	188	92	Miocene, 3470+	28.0	Gulf Coast basin	—
Main Pass 306, US, 1969	98	3	61	89	Miocene, 6,167	37.0	Gulf Coast basin	—
Mississippi Canyon, US, 1980	11	6	12	95	—	—	Gulf Coast basin	—
Ship Shoal 204, US, 1968	58	3	55	50	Pliocene, 7,568+	31.0	Gulf Coast basin	—
Ship Shoal 208, US, 1962	93	4	133	93	Miocene, 9,185+	30.0	Gulf Coast basin	—
South Pass 61, US, 1968	123	10	80	95	Miocene, 6,005	24.0	Gulf Coast basin	—
South Pass 62, US, 1965	81	4	85	103	Pliocene, 5,392+	41.0	Gulf Coast basin	—
South Pass 65, US, 1969	56	3	83	108	Miocene, 8,033	32.0	Gulf Coast basin	—
South Timbalier 135, US, 1956	59	2	131	34	Miocene, 8,823+	31.0	Gulf Coast basin	—
West Delta 73, U.S., 1962	85	3	166	109	Miocene, 8,300+	29.0	Gulf Coast basin	—
Pine, USA, 1951	97	2	94	17	Interlake, 8,618	34.0	Williston basin	Anticline
Bell Creek, USA, 1967	160	4	117	36	Muddy 4,532	31.0	Williston basin	Strat trap
Beaver Lodge, USA, 1951	153	3	100	22	Miss. et al., 8,555+	42.0	Williston basin	Anticline
Billings Nose, USA								
Four Eyes, 1978	13	2	6	82	Duperow	—	Williston basin	—
Big Stick, 1979	47	9	17	82	Duperow	—	Williston basin	—
T-R, 1978	45	2	8	82	Madison	—	Williston basin	—
Little Knife, USA, 1977	115	5	17	83	Mission Cannon	—	Williston basin	—
Mondak, 1976	167	2	9	91	Red River,	—	Williston basin	—
Postle, US. 1960	322	2	95	25	Morrow, 6,112	43.0	Anadarko basin	—
Sooner Trend, US, 1965	4,420	8	244	51	Various	—	Anadarko basin shelf	—
Lake Pasture, US, 1953	197	3	71	29	Frio, 5,958	36.0	South Texas basin	—
Giddings, US, 1971	1,400	33	125	300	Chalk 7,400	40.0	Gulf Coast basin	—
Fairway, US 1960	90	5	169	41	Pettet 10,184	47.0	East Texas basin	—
Neches, US, 1953	136	3	89	21	Woodbine, 4,103	31.0	East Texas basin	—
Prentice, US, 1951	299	4	127	33	Glorieta 5,940	27.0	Permian basin	—
Salt Creek, US, Tex, 1950	121	7	196	64	Canyon 6,484	39.0	Permian basin	—
Spraberry Trend, US, 1951	5,479	16	501	75	6,659 Spraberry	40.0	Permian basin	—
Altamont, US, 1955	332	8	104	259	Wasatah 12,910	44.0	Uinta basin	—
Aneth, US, 1956	462	7	313	55	Paradox, 5,446	40.0	Paradox basin	Reef
Red Wash, US, 1951	231	3	113	24	Green River 5,400	28.0	Uinta basin	—
Pineview, US, 1975	29	3	21	125	Nugget, 9,811	50.0	Overthrust belt	Anticline
Brady, US, 1960	17	3	32	71	Nugget 11,592	—	Green river basin	Anticline
Hartzog Draw, US, 1976	172	4	33	67	Shannon 9,160	—	Powder River basin	Strat trap
Painter Reservoir, US, 1979	34	5	7	115	Nugget, 9,728+	48.4	Overthrust Belt anticline	Crest of overturned
Whitney Canyon-Carter Creek, US, 1980	3	.04	.04	115	Thaynes 9,190	Wet gas	Overthrust Belt	Has multiple closures
Namorado, Brazil, 1975	4	5	10	250	Macae 10.083	28.0	Campos basin	Offshore
Handil, Indonesia, 1974	90	50	341	—	Miocene, 7,543	31.3	Kutei basin	Anticline
Bombay High India, 1974	—	—	—	1,500	Miocene, 4,530-4,630	—	Bombay Offsnore basin	Anticline
Nembe Creek Nigeria, 1973	30	18	84	645	Miocene, 7,000-12,000	16-41.0	Niger Delta	Delta Trap

Gas production (billions cu ft)

	1982
WESTERN HEMISPHERE	
Argentina	386.2
Bolivia	98.4
Brazil	106.7
Canada	2,546.1
Chile	178.2
Colombia	104.4
Ecuador	1.9
Guatemala	....
Mexico	1,549.7
Peru	33.6
Trinidad	85.2
United States	18,731.0
Venezuela	527.2
Total	**24,348.6**
EUROPE	
Austria	48.9
France	332.6
West Germany	585.3
Greece	....
Italy	503.6
Netherlands	2,521.7
Norway	861.9
Spain	12.0
United Kingdom	1,276.1
Total	**6,142.1**
MIDDLE EAST	
Abu Dhabi	242.3
Bahrain	178.9
Dubai	28.8
Iran	381.5
Iraq	22.9
Israel	3.6
Kuwait	133.8
Oman	75.6
Qatar	128.5
Saudi Arabia	590.8
Syria	8.4
Turkey	3.6
Total	**1,799.7**
ASIA-PACIFIC	
Afghanistan	158.4
Australia	415.8
Burma	16.8
Malasia	37.2
Brunei	342.0
India	81.5
Indonesia	568.9
Japan	99.9
New Zealand	100.8
Pakistan	315.3
Taiwan	60.0
Total	**2,176.5**
AFRICA	
Algeria	828.5
Angola	8.4
Egypt	86.4
Gabon	4.8
Ivory Coast	....
Libya	153.2
Morocco	3.6
Nigeria	68.5
Tunisia	15.5
Total	**1,168.9**
COMMUNIST	
China	364.0
Romania	1,150.0
USSR	17,685.0
Other	1,059.0
Total	**20,258.0**
WORLD TOTAL	**55,893.9**

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1981 well completions —AAPG—API data

Country	Total wells	Oil	Gas	Dry Others	Footage
Middle East					
Kuwait	2	0	0	2	41,705
Qatar	3	—	—	—	—
Abu Dhabi	9	2	1	6	77,840
Dubai	1	—	—	—	—
Sharjah	3	—	—	—	—
Omar	27	20	1	6	191,167
Yemen	3	0	0	3	10,207
Syria	3	0	0	3	24,429
Turkey	29	2	0	27	169,306
Total	**80**				
Europe					
Austria Dev.	39	20	4	5	295,955
Denmark, North Sea	9	9	0	0	—
France	81	65	3	13	504,503
Greece	6	1	0	5	51,183
Italy	17	2	2	13	142,724
Netherlands, Onshore	55	21	13	21	286,100
North Sea	9	0	8	1	—
Norway, North Sea	15	11	0	4	—
Spain	7	3	2	2	75,771
Sweden	2	2	0	0	1,646
UK, Onshore	7	6	0	1	30,513
North Sea	174	119	3	52	—
Germany	49	32	12	5	112,351
Yugoslavia	120	22	3	95	689,100
Total	**590**	**313**	**50**	**227**	—
	Wildcats				
Austria	33	4	4	25	205,259
Belgium	4	0	0	4	38,716
Denmark, Onshore	2	0	1	1	8,330
North Sea	3	2	1	0	21,200
Eire	11	1	1	9	76,700
France	38	0	0	38	333,497
Greece	5	0	1	4	—
Italy	91	9	26	56	754,956
Netherlands, Onshore	12	0	6	6	96,310
North Sea	26	5	5	16	266,200
Norway, Onshore	6	0	3	3	59,186
North Sea	35	16	7	12	395,089
Portugal	1	0	0	1	15,371
Spain	33	1	5	27	208,438
Sweden	18	1	0	17	14,765
Switzerland	3	0	1	2	13,616
UK Onshore	24	3	1	20	32,100
North Sea	68	30	5	33	781,000
Germany, Onshore	62	10	14	38	513,870
North Sea	3	0	1	2	39,200
Yugoslavia	29	4	4	21	493,314
Total	**567**	**86**	**86**	**335**	—
	Wildcats				**Meters (footage)**
Latin America					
Argentina	127	29	13	85	—
Barbados	3	0	1	2	(23,982)
Belize	3	0	0	3	(26,167)
Bolivia	19	5	1	13	70,535
Brazil	245	52	9	184	592,901
Chile	62	10	14	38	—
Colombia	114	13	2	99	(482,196)
Ecuador	3	1	0	2	(19,230)
Guatemala	6	2	—	4	(72,527)
Guyana	1	0	0	1	—
Jamaica	2	0	0	2	—
Mexico	63	13	11	39	225,571
Peru	17	9	1	7	(150,098)
Paraguay	1	0	0	1	(10,575)
Trinadad-Tobago	16	6	0	10	50,353
Venezuela	351	—	—	—	—
Total	**1033**	**140**	**52**	—	—
	Field wells				
Argentina	834	699	34	101	—
Bolivia	20	6	0	14	37,017
Brazil	395	345	10	64	538,569
Chile	56	35	6	15	231,948
Columbia	113	109	0	4	(569,608)
Ecuador	26	23	0	3	(228,480)
Guatemala	2	2	0	0	—
Mexico	315	201	69	45	1,035,610
Peru	160	145	4	11	(913,213)
Trinidad-Tobago	163	155	4	4	189,256
Venezuela	712	—	—	—	—
Total	**2,796**	**1,720**	**127**	—	—
	Wildcats				**Footage**
North Africa					
Algeria	1	—	—	—	2,936
Egypt	64	—	—	—	574,815
Libya	43	—	—	—	427,500
Morocco	14	—	—	—	109,750

Country	Total wells	Oil	Gas	Dry Others	Footage
Sudan	14	—	—	—	138,346
Tunisia	33	—	—	—	298,500
Total 1981	169	—	—	—	1,551,847
Total 1980	115	—	—	—	1,138,943
	Field wells				
Algeria	—	—	—	—	—
Egypt	49	—	—	—	382,200
Libya	114	—	—	—	725,000
Tunisia	3	—	—	—	19,900
	Wildcats				
Other Africa					
Angola	9	2	1	6	80,688
Cabinda	5	1	0	4	30,928
Cameroon	18	3	7	8	117,621
Congo	5	2	0	3	33,016
Gabon	23	4	0	19	193,264
Ghana	1	0	0	1	9,100
Ivory Coast	10	2	4	4	104,809
Kenya	1	0	0	1	16,019
Nigeria	26	14	3	9	275,871
South Africa	12	0	0	12	121,858
Seychelles	2	0	0	2	21,792
Zaire	3	1	0	2	37,776
Total	**115**	**29**	**15**	**71**	**1,042,742**
	Field wells				
Angola	9	8	0	1	74,131
Cabinda	6	5	0	1	67,328
Benin	9	5	0	4	—
Cameroon	51	50	0	1	373,621
Congo	32	29	0	3	242,143
Gabon	47	35	0	12	307,545
Ghana	2	0	0	2	18,142
Ivory Coast	10	8	0	2	95,851
Nigeria	143	125	0	18	1,305,210
South Africa	3	2	0	1	19,158
Tanzania	3	2	0	1	—
Zaire	6	5	0	1	30,173
Total	**321**	**274**	**0**	**47**	—

	Wildcats		Field	
	Wells	Footage	Wells	Footage
Australia				
Queensland	53	353,929	40	221,254
New S. Wales	9	14,038	—	—
Victoria	4	21,036	1	5,259
Offshore	7	35,019	16	138,715
South Australia	20	145,351	28	102,099
Offshore	1		8,553	—
Western Australia	20	116,619	18	62,276
Offshore	5	49,386	4	51,033
Northern Territory	5	35,461	—	—
Offshore	1	12,178	—	—
Total Onshore	**111**	**686,434**	**87**	**390,888**
Total Offshore	**14**	**105,136**	**20**	**198,748**

Country	Total wells	Oil	Gas	Dry Others	Footage
New Zealand	10	—	—	—	13.60m
Far East					
Bangladesh	3	0	2	1	37,432 ft.
Brunei	3	2	0	1	24,880
Burma	18	6	1	11	—
Indonesia	221	67	41	113	1,456,000
Japan	23	6	3	14	204,000
Malaysia	60	4	0	56	378,000
Pakistan	13	1	0	12	141,000
Peoples Rep. China	10	4	0	6	115,142
Philippines	17	0	0	17	198,000
South Korea	1	0	0	1	13,747
Sri Lanka	2	0	0	2	16,608
Taiwan	36	1	16	19	337,000
Total	**407**	**91**	**63**	**253**	—
United States					
Field	63,370	35,452	15,528	12,390	—
	—	—	—	—	272,319,296 ft.
Wildcats	15,168	2,219	2,366	10,583	89,067,222
Total*	**80,537**	**37,671**	**17,894**	**24,972**	**366,240,130 ft.**
*Includes service et al.					
Western Canada					
Wildcats	3,074	740	1,172	1,162	—
Field	3,830	1,334	2,034	462	—
Total	**6,904**	**2,074**	**3,206**	**1,624**	—
Eastern Canada	250	6	77	167	—
World Totals					
Total	—	—	—	—	—
Wells... 94,010	—	—	—	—	—

Worldwide production statistics

NORTH AMERICA

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1974	1975	1976	1977	1978	1979	1980	1981	1982
Canada	23.5	79.6	525.6	801.4	1,263.6	1,689.0	1,426.0	1,335.0	1,321.0	1,324.0	1,496.0	1,412.0	1,287.0	1,233.0
	1.2	4.0	26.2	39.9	62.9	84.1	71.0	66.5	65.8	65.9	74.5	70.3	63.9	61.2
United States	3,707.4	5,407.1	7,054.6	7,804.1	9,630.0	8,774.0	8,374.0	8,132.0	8,245.0	8,701.0	8,544.0	8,569.0	8,568.0	8,655.0
	184.6	269.3	351.3	388.6	479.6	436.9	417.0	405.0	410.6	433.3	425.4	426.7	426.3	429.6
Total	**3,730.9**	**5,486.7**	**7,580.2**	**8,605.5**	**10,893.6**	**10,463.0**	**9,800.0**	**9,467.0**	**9,566.0**	**10,025.0**	**10,040.0**	**9,981.0**	**9,875.0**	**9,888.0**
	185.6	**273.3**	**377.5**	**428.5**	**542.5**	**521.0**	**488.0**	**471.5**	**476.4**	**499.2**	**499.9**	**497.0**	**490.2**	**490.8**

AFRICA

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1974	1975	1976	1977	1978	1979	1980	1981	1982
Algeria	...	...	182.7	551.6	1,029.1	1,008.6	982.6	1,075.1	1,152.3	1,161.2	1,175.0	1,016.0	750.0	750.0
	...	...	9.1	27.5	51.2	50.2	48.9	53.5	57.4	57.8	58.5	50.6	37.2	37.2
Angola (inc. Cabinda)	...	...	1.3	13.0	13.7	169.0	166.0	108.0	195.0	130.0	147.0	150.0	140.0	122.0
	...	...	0.1	0.6	0.7	8.4	8.3	5.4	9.7	6.5	7.3	7.5	6.9	6.1
Cameroon	...	...	...	...	...	...	...	...	...	10.0	34.0	58.0	87.0	109.0
	...	...	...	...	...	...	...	...	...	0.5	1.7	2.9	4.3	5.4
Congo	...	...	...	...	...	32.0	38.0	39.0	35.0	26.0	57.0	56.0	79.0	87.0
	...	...	...	...	...	1.6	1.9	1.9	1.7	1.4	2.8	2.8	3.9	4.3
Egypt	18.1	44.9	61.6	122.7	327.3	144.0	230.0	328.0	413.0	464.0	526.0	596.0	578.0	667.0
	0.9	2.2	3.1	6.1	16.3	7.2	11.5	16.3	20.6	23.1	26.2	29.7	28.7	33.1
Gabon	...	...	16.1	25.2	108.8	201.5	223.0	222.8	222.0	208.7	204.0	180.0	147.0	130.0
	...	...	0.8	1.3	5.4	10.0	11.1	11.1	11.1	10.4	10.2	9.0	7.3	6.5
Libya	...	...	...	1,220.0	3,318.0	1,521.3	1,479.8	1,932.6	2,063.4	1,982.5	2,066.0	1,785.0	1,063.0	1,127.0
	...	...	...	60.8	165.2	75.8	73.7	96.2	102.8	98.7	102.9	88.9	52.8	55.9
Nigeria	...	...	17.3	272.2	1,083.3	2,255.0	1,783.2	2,066.8	2,085.1	1,897.0	2,303.0	2,057.0	1,369.0	1,324.0
	...	...	0.9	13.6	53.9	112.3	88.8	102.9	103.8	94.5	114.7	102.4	68.0	65.7
Tunisia	...	...	3.0	3.6	87.7	88.0	95.0	73.0	87.0	100.0	100.0	110.0	118.0	106.0
	...	...	0.1	0.2	4.4	4.4	4.7	3.6	4.3	5.0	5.0	5.5	5.8	5.3
Zaire	...	...	...	...	...	...	...	20.0	24.0	20.0	21.0	20.0	20.0	22.0
	...	...	...	...	...	...	...	1.0	1.2	1.0	1.0	1.0	1.0	1.1
Others	...	0.8	3.0	3.6	1.5	0.9	0.7	0.1	0.4	0.1	5.0	4.0	9.2	10.7
	...	...	0.1	0.2	0.1	...	...	...	...	...	0.2	0.2	0.5	0.5
Total	**18.1**	**45.7**	**285.0**	**2,211.9**	**5,969.4**	**5,420.3**	**4,998.3**	**5,865.4**	**6,277.2**	**6,001.5**	**6,637.0**	**6,032.0**	**4,360.2**	**4,454.7**
	0.9	**2.2**	**14.2**	**110.3**	**297.2**	**269.9**	**248.9**	**291.9**	**312.6**	**298.9**	**330.5**	**300.3**	**216.4**	**221.1**

FIRST well ever drilled by Esso on Thailand's Khorat Plateau tapped prolific gas.

ASIA-PACIFIC

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1974	1975	1976	1977	1978	1979	1980	1981	1982
Afghanistan	...	...	...	...	...	...	...	0.2	0.2	0.2	...	...	...	...
	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Australia	...	...	...	7.2	175.6	385.0	411.0	417.0	431.0	430.0	441.0	379.0	382.0	353.0
	...	...	...	0.4	8.7	19.2	20.5	20.8	21.5	21.4	22.0	18.9	19.0	17.5
Brunei	19.3	84.8	92.9	80.4	148.0	328.0	175.0	200.0	207.0	210.0	256.0	230.0	166.0	155.0
	1.0	4.2	4.6	4.0	7.4	16.3	8.7	10.0	10.3	10.5	12.7	11.5	8.2	7.7
Burma	21.1	1.5	11.1	12.1	16.4	20.0	20.0	20.0	23.0	25.0	30.0	30.0	30.0	30.0
	1.0	0.1	0.6	0.6	0.8	1.0	1.0	1.0	1.1	1.2	1.5	1.5	1.5	1.5
India	3.9	5.1	9.0	61.8	138.6	149.0	165.0	180.0	200.0	230.0	245.0	182.0	298.0	384.0
	0.2	0.2	0.4	3.1	6.9	7.4	8.2	9.0	10.0	11.5	12.2	9.1	14.8	19.1
Indonesia	169.4	132.6	411.2	485.0	853.6	1,374.5	1,306.5	1,503.6	1,686.1	1,635.2	1,595.0	1,576.0	1,067.0	1,341.0
	8.4	6.6	20.5	24.1	42.5	68.4	65.1	74.9	84.0	81.4	79.4	78.5	53.0	66.6
Japan	7.2	5.6	10.2	11.4	16.3	15.0	12.0	12.0	10.0	10.0	8.0	10.0	7.0	6.0
	0.4	0.3	0.5	0.6	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.5	0.3	0.3
Malaysia	...	...	...	...	...	...	100.0	161.0	190.0	210.0	259.0	288.0	259.0	306.0
	...	...	...	...	...	...	5.0	8.0	9.5	10.5	12.9	14.3	12.9	15.2
New Guinea	...	4.8	4.2	...	...	...	...	...	...	...	...	...	...	...
	...	0.2	0.2	...	...	...	...	...	...	...	...	...	...	...
New Zealand	...	...	...	...	...	...	...	10.0	15.0	13.0	9.0	7.0	10.0	15.0
	...	...	...	...	...	...	...	0.5	0.7	0.6	0.4	0.3	0.5	0.7
Pakistan	2.4	3.5	7.2	11.2	9.9	9.0	6.0	7.0	10.0	9.3	10.0	10.0	10.0	12.0
	0.1	0.2	0.4	0.6	0.5	0.4	0.3	0.3	0.5	0.5	0.5	0.5	0.5	0.6
Philippines	...	...	...	...	...	...	...	...	...	...	26.0	15.0	2.0	7.0
	...	...	...	...	...	...	...	...	...	...	1.3	0.7	0.1	0.3
Taiwan	...	...	0.4	0.4	1.8	3.0	5.0	4.2	5.0	4.3	5.0	5.0	3.0	3.0
	...	...	...	...	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1
Thailand	...	...	...	...	0.4	0.2	0.2	0.3	0.2	0.2	...	...	...	6.0
	...	...	...	...	...	...	...	...	...	...	...	...	...	0.3
Total	**223.3**	**237.9**	**546.2**	**669.5**	**1,360.6**	**2,283.7**	**2,200.7**	**2,515.3**	**2,777.5**	**2,777.2**	**2,883.0**	**2,732.0**	**2,234.0**	**2,619.0**
	11.1	**11.8**	**27.2**	**33.4**	**67.7**	**113.5**	**109.6**	**125.3**	**138.3**	**138.3**	**143.5**	**136.0**	**110.9**	**129.9**

EUROPE

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1974	1975	1976	1977	1978	1979	1980	1981	1982
Austria	7.7	27.9	45.4	53.1	53.3	46.0	40.0	37.0	36.0	35.0	35.0	29.0	25.0	25.0
	0.4	1.4	2.3	2.6	2.7	2.3	2.0	1.8	1.8	1.7	1.7	1.4	1.2	1.2
Denmark	...	...	...	...	...	3.0	3.0	3.0	9.0	10.0	8.0	6.0	16.0	38.0
	...	...	...	...	...	0.1	0.1	0.1	0.4	0.5	0.4	0.3	0.8	1.9
France	1.4	2.5	38.6	59.5	45.8	23.0	20.0	20.0	20.0	21.0	20.0	26.0	34.0	33.0
	0.1	0.1	1.9	3.0	2.3	1.1	1.0	1.0	1.0	1.0	1.0	1.3	1.7	1.6
Germany, Fed. Rep.	20.1	22.2	107.3	155.0	147.2	121.0	112.0	110.0	108.0	102.0	94.0	90.0	86.0	84.0
	1.0	1.1	5.3	7.7	7.3	6.0	5.6	5.5	5.4	5.1	4.7	4.5	4.3	4.1
Greece	...	...	...	...	...	...	...	...	...	...	...	...	8.0	21.0
	...	...	...	...	...	...	...	...	...	...	...	...	0.4	1.0
Italy	0.2	0.2	37.5	47.0	26.3	19.0	19.0	20.0	18.0	28.0	30.0	39.0	37.0	28.0
	...	...	1.9	2.3	1.3	0.9	0.9	1.0	0.9	1.4	1.5	1.9	1.8	1.4
Netherlands	...	13.4	36.0	37.0	35.8	30.0	30.0	31.0	30.0	36.0	25.0	25.0	27.0	28.0
	...	0.7	1.8	1.9	1.8	1.5	1.5	1.5	1.5	1.8	1.2	1.2	1.3	1.4
Norway	...	...	...	...	...	35.0	189.0	279.0	270.0	350.0	403.0	528.0	508.0	488.0
	...	...	...	...	...	1.7	9.4	13.9	13.4	17.4	20.1	26.3	25.2	24.2
Spain	...	...	...	...	3.6	37.0	36.0	40.0	21.0	20.0	15.0	30.0	24.0	30.0
	...	...	...	...	0.2	1.8	1.8	2.0	1.0	1.0	0.7	1.5	1.2	1.5
United Kingdom	0.3	0.9	1.7	1.7	1.7	2.0	12.0	245.0	744.0	1,082.0	1,568.0	1,619.0	1,790.0	2,050.0
	...	...	0.1	0.1	0.1	0.1	0.6	12.2	37.0	53.9	78.1	80.6	88.9	101.8
Total	**29.7**	**67.1**	**266.5**	**353.3**	**313.7**	**316.0**	**461.0**	**785.0**	**1,256.0**	**1,664.0**	**2,198.0**	**2,392.0**	**2,555.0**	**2,825.0**
	1.5	**3.3**	**13.2**	**17.5**	**15.6**	**15.7**	**22.9**	**38.9**	**62.3**	**82.6**	**109.1**	**118.7**	**126.8**	**140.2**

MIDDLE EAST

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1974	1975	1976	1977	1978	1979	1980	1981	1982
Abu Dhabi	...	...	...	281.9	693.8	1,421.0	1,403.0	1,590.0	1,680.0	1,450.0	1,464.0	1,350.0	1,145.0	883.0
	...	...	...	14.0	34.6	70.8	69.9	79.2	83.7	72.2	72.9	67.2	56.8	43.8
Bahrain	19.3	30.2	45.1	57.0	76.6	67.0	61.0	58.0	54.0	56.0	51.0	48.0	44.0	45.0
	0.9	1.5	2.2	2.8	3.8	3.3	3.0	2.9	2.7	2.8	2.5	2.4	2.2	2.2
Dubai	...	...	...	...	...	239.0	254.0	315.0	320.0	360.0	354.0	349.0	358.0	357.0
	...	...	...	...	...	11.9	12.6	15.7	15.9	17.9	17.6	17.4	17.8	17.7
Iran	181.2	664.3	1,067.6	1,885.5	3,328.8	6,021.6	5,350.1	5,882.9	5,662.8	5,241.7	3,101.0	1,467.0	1,375.0	1,896.0
	9.0	33.1	53.2	93.9	165.8	299.9	266.4	293.0	282.0	261.0	154.4	73.0	68.2	94.1
Iraq	60.7	136.2	1,004.2	1,315.2	1,548.6	1,970.6	2,261.7	2,415.4	2,348.2	2,562.0	3,434.0	2,638.0	892.0	914.0
	3.0	6.8	50.0	65.5	77.1	98.1	112.6	120.3	116.9	127.6	171.0	131.3	44.3	45.4
Israel	...	...	2.5	4.0	70.2	100.0	75.0	0.7	0.7	10.0	31.0	1.0	0.3	0.3
	...	...	0.1	0.2	3.5	5.0	3.7	...	...	0.5	1.5	...	...	...
Kuwait	...	344.4	1,628.2	2,169.5	2,734.5	2,276.0	1,837.0	1,913.0	1,783.0	1,865.0	2,213.0	1,382.0	916.0	675.0
	...	17.1	81.1	108.0	136.2	113.3	91.5	95.3	88.8	92.9	110.2	68.8	45.5	33.5
Neutral Zone	...	...	136.2	360.9	500.6	541.0	496.0	471.0	355.0	466.0	567.0	540.0	370.0	315.0
	...	...	6.8	18.0	24.9	26.9	24.7	23.5	17.7	23.2	28.2	26.9	18.4	15.6
Oman	...	...	...	...	332.4	291.0	341.0	366.0	350.0	320.0	295.0	283.0	317.0	328.0
	...	...	...	...	16.6	14.5	17.0	18.2	17.4	15.9	14.7	14.1	15.7	16.2
Qatar	...	33.6	175.1	231.1	362.4	518.4	437.6	497.6	444.6	486.7	504.0	472.0	414.0	340.0
	...	1.7	8.7	11.5	18.0	25.8	21.8	24.8	22.1	24.2	25.1	23.5	20.6	16.9
Saudi Arabia	13.9	546.7	1,247.1	2,024.9	3,548.9	8,210.0	6,827.0	8,344.0	9,014.0	8,059.0	9,251.0	9,630.0	9,642.0	6,484.0
	0.7	27.2	62.1	100.8	176.7	408.9	340.0	415.5	448.9	401.3	460.6	479.5	478.6	321.9
Sharjah	...	...	...	...	...	...	38.0	37.0	30.0	24.0	13.0	10.0	9.0	7.0
	...	...	...	...	...	...	1.9	1.8	1.5	1.2	0.6	0.5	0.5	0.3
Syria	...	...	...	...	83.1	132.0	175.0	175.0	200.0	170.0	163.0	165.0	166.0	175.0
	...	...	...	...	4.1	6.6	8.7	8.7	10.0	8.5	8.1	8.2	8.2	8.7
Turkey	...	0.3	7.0	29.7	67.9	65.0	60.0	69.0	65.0	50.0	56.0	46.0	46.0	45.0
	...	...	0.3	1.5	3.4	3.2	3.0	3.4	3.2	2.5	2.8	2.2	2.3	2.2
Total	**275.1**	**1,755.7**	**5,313.0**	**8,359.7**	**13,347.8**	**21,852.6**	**19,616.4**	**22,134.6**	**22,307.3**	**21,120.4**	**21,496.0**	**18,379.0**	**15,694.3**	**12,464.3**
	13.6	**87.4**	**264.5**	**416.2**	**554.7**	**1,088.2**	**976.8**	**1,102.3**	**1,110.8**	**1,051.7**	**1,070.3**	**915.0**	**779.1**	**618.7**

*Totals may not add due to rounding.

LATIN AMERICA

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1974	1975	1976	1977	1978	1979	1980	1981	1982
Argentina	56.3	64.0	171.9	269.3	382.9	414.0	396.0	398.0	431.0	453.0	467.0	487.0	497.0	483.0
	2.8	3.2	8.6	13.4	19.1	20.6	19.7	19.8	21.5	22.6	23.3	24.2	24.7	24.0
Bolivia	0.8	1.7	9.8	9.2	16.3	49.0	42.0	41.0	35.0	30.0	30.0	30.0	24.0	24.0
	...	0.1	0.5	0.5	0.8	2.4	2.1	2.0	1.7	1.5	1.5	1.5	1.2	1.2
Brazil	...	0.9	80.9	94.0	160.5	179.0	174.0	171.0	162.0	160.0	161.0	182.0	215.0	252.0
	...	...	4.0	4.7	8.0	8.9	8.7	8.5	8.1	8.0	8.0	9.1	10.7	12.5
Chile	...	1.7	19.8	34.9	34.6	29.0	25.0	24.0	22.0	20.7	23.0	29.0	40.0	41.0
	...	0.1	1.0	1.7	1.7	1.4	1.2	1.2	1.1	1.0	1.1	1.4	2.0	2.0
Colombia	69.9	93.3	152.7	210.0	214.0	173.0	160.0	147.0	140.0	130.0	124.0	125.0	125.0	140.0
	3.5	4.6	7.6	10.0	10.7	8.6	8.0	7.3	7.0	6.5	6.2	6.2	6.2	6.9
Ecuador	6.4	7.2	7.7	8.0	4.1	177.0	160.9	187.8	183.4	201.8	225.0	222.0	204.0	215.0
	0.3	0.4	0.4	0.4	0.2	8.8	8.0	9.3	9.1	10.0	11.2	11.1	10.1	10.7
Guatemala	...	...	...	...	...	...	...	...	...	...	2.0	5.0	5.0	6.4
	...	...	...	...	...	...	...	...	...	...	0.1	0.2	0.2	0.3
Mexico	120.3	198.5	270.6	323.1	430.2	653.0	806.0	894.0	981.0	1,207.0	1,461.0	1,936.0	2,390.0	2,734.0
	6.0	9.9	13.5	16.1	21.4	32.5	40.1	44.5	48.8	60.1	72.7	96.4	118.6	135.7
Peru	33.2	41.1	52.6	63.2	72.2	76.0	73.0	75.0	90.0	150.0	195.0	191.0	184.0	198.0
	1.6	2.0	2.6	3.1	3.6	3.8	3.6	3.7	4.5	7.5	9.7	9.5	9.1	9.8
Trinidad & Tobogo	60.9	56.5	115.7	133.9	139.8	178.0	205.0	224.0	230.0	240.0	215.0	211.0	240.0	182.0
	3.0	2.8	5.8	6.7	7.0	8.9	10.2	11.2	11.5	12.0	10.7	10.5	11.9	9.0
Venezuela	507.0	1,498.0	2,846.1	3,472.9	3,708.0	2,976.3	2,346.2	2,294.4	2,237.9	2,165.5	2,356.0	2,167.0	2,093.0	1,826.0
	25.2	74.6	141.7	172.9	184.7	148.2	116.8	114.3	111.4	107.8	117.3	107.9	103.9	90.6
Others	...	...	...	...	...	...	...	...	...	...	...	...	...	0.6
	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total	**854.8**	**1,962.9**	**3,727.8**	**4,609.5**	**5,162.6**	**4,904.3**	**4,388.1**	**4,456.4**	**4,512.3**	**4,758.0**	**5,259.0**	**5,586.0**	**6,017.0**	**6,102.0**
	42.4	**97.7**	**185.7**	**229.5**	**257.2**	**244.1**	**218.4**	**221.8**	**224.7**	**237.0**	**261.8**	**278.1**	**298.7**	**302.9**
Total non-Communist	**5,131.9**	**9,556.0**	**17,718.7**	**24,809.4**	**37,047.7**	**45,167.9**	**41,539.8**	**45,223.9**	**46,696.6**	**46,366.8**	**48,515.0**	**42,417.3**	**40,735.5**	**38,352.0**
	255.3	**474.4**	**879.6**	**1,231.5**	**1,839.0**	**2,242.1**	**2,062.0**	**2,244.9**	**2,318.0**	**2,301.6**	**2,408.3**	**2,105.6**	**2,022.1**	**1,903.8**

COMMUNIST AREAS

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1974	1975	1976	1977	1978	1979	1980	1981	1982
Bulgaria	...	...	4.0	4.6	6.7	2.9	2.4	2.4	2.6	5.1	5.3	6.0	6.0	6.0
	...	...	0.2	0.2	0.3	0.1	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3
China	...	4.0	100.0	220.0	500.0	1,364.0	1,542.0	1,736.0	1,874.0	2,090.4	2,130.5	2,119.0	2,024.4	2,040.0
	...	0.2	5.0	11.0	24.9	67.9	76.8	86.5	93.3	104.1	106.1	105.9	101.2	102.0
Czechoslovakia	...	0.8	2.7	3.9	4.1	3.0	2.8	2.6	2.5	2.3	2.2	1.9	1.7	1.7
	...	...	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
German Dem. Rep.	...	1.0	1.0	1.0	1.2	4.0	4.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
	...	...	...	...	0.1	0.2	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Hungary	...	10.1	24.3	36.1	38.7	39.9	40.1	43.0	44.0	44.1	40.7	40.6	40.5	41.0
	...	0.5	1.2	1.8	1.9	2.0	2.0	2.1	2.2	2.2	2.0	2.0	2.0	2.0
Poland	...	3.3	3.9	6.8	8.5	11.0	11.1	9.1	7.3	7.3	6.6	6.5	6.0	6.0
	...	0.2	0.2	0.3	0.4	0.5	0.6	0.5	0.4	0.4	0.3	0.3	0.3	0.3
Romania	...	87.7	231.0	252.4	268.6	296.0	293.0	295.2	294.2	275.6	247.0	230.9	232.0	240.0
	...	4.4	11.5	12.6	13.4	14.7	14.6	14.7	14.7	13.7	12.3	11.5	11.6	12.0
U.S.S.R.*	624.9	760.6	2,969.1	4,877.3	7,089.2	9,215.8	9,855.5	10,435.3	10,959.8	11,476.6	11,758.5	12,031.0	12,180.0	12,260.0
	31.1	37.9	147.9	242.9	353.0	458.9	490.8	519.7	545.8	571.5	585.6	603.2	609.0	613.0
Yugoslavia	0.3	2.1	18.8	407	57.8	67.0	75.0	77.5	79.0	82.0	70.0	84.5	87.6	89.6
	...	0.1	0.9	2.0	2.9	3.3	3.7	3.9	3.9	4.1	3.5	4.2	4.4	4.5
Others	...	2.7	14.9	19.0	37.1	36.6	36.6	50.0	50.0	50.0	50.0	50.0	57.2	60.0
	...	0.1	0.7	0.9	1.8	1.8	1.8	2.5	2.5	2.5	2.5	2.5	2.9	3.0
Total	**625.2**	**872.3**	**3,369.7**	**5,461.8**	**8,011.9**	**11,040.2**	**11,787.5**	**12,661.1**	**13,323.4**	**14,043.4**	**14,320.8**	**14,580.0**	**14,645.4**	**14,754.3**
	31.1	**43.3**	**167.3**	**271.1**	**397.7**	**548.0**	**585.1**	**628.5**	**661.4**	**697.1**	**710.9**	**730.5**	**732.3**	**737.7**

*Includes gas liquids

World Total	**5,757.1**	**10,428.3**	**21,088.4**	**30,271.2**	**45,059.6**	**56,280.1**	**53,327.3**	**57,885.0**	**60,020.0**	**60,410.2**	**62,835.8**	**56,997.3**	**55,380.9**	**53,106.3**
	286.4	**519.1**	**1,050.1**	**1,507.4**	**2,243.9**	**2,801.7**	**2,655.3**	**2,882.4**	**2,988.7**	**3,008.4**	**3,128.7**	**2,829.3**	**2,757.7**	**2,644.4**

***CONSUMPTION** of oil products continues to decrease around the world.*

World oil consumption

Upper figures = 1,000 b/d
Lower figures = million t/y

	1979	1980	1981
U.S.A.	17,930 862.9	16,390 791.4	15,480 743.2
Canada	1,895 89.9	1,855 87.5	1,745 81.6
Total North America	19,825 952.8	18,245 878.9	17,225 824.8
Latin America	4,395 211.8	4,610 222.1	4,745 227.8
Total Western Hemisphere	**24,220** 1,164.6	**22,855** 1,101.0	**21,970** 1,052.6
Austria	250 12.4	245 12.1	220 10.9
Belgium & Luxembourg	595 29.4	545 27.0	520 25.6
Denmark	325 16.1	265 13.2	240 11.7
Finland	265 13.3	255 12.8	240 12.0
France	2,430 118.1	2,295 111.1	2,070 99.3
Germany, Fed. Rep.	3,045 146.9	2,735 131.1	2,465 117.6
Greece	240 11.9	250 12.5	240 11.9
Ireland	130 6.2	120 5.7	115 5.4
Italy	2,045 101.2	1,985 98.1	1,935 95.5
Netherlands	800 38.5	815 39.2	730 35.2
Norway	185 9.0	165 8.2	155 7.5
Portugal	160 7.7	170 8.5	180 8.9
Spain	970 47.3	1,040 50.7	990 48.0
Sweden	565 28.4	495 24.6	440 21.8
Switzerland	270 12.9	270 12.8	250 11.9
United Kingdom	1,935 94.1	1,675 80.6	1,555 74.6
Yugoslavia	315 15.8	300 15.1	285 14.4
Other	335 16.8	390 19.2	355 17.3
Total Western Europe	14,860 726.0	14,015 682.5	12,985 629.5
Middle East	1,795 90.0	1,630 82.0	1,685 84.7
Africa	1,310 63.5	1,485 71.9	1,565 75.9
South Asia	755 36.7	785 38.4	890 43.4
Southeast Asia	2,345 116.9	2,445 121.6	2,480 123.7
Japan	5,495 265.4	5,010 240.9	4,700 224.3
Australasia	800 38.0	775 36.5	770 36.3
U.S.S.R.	8,925 441.0	8,820 436.0	8,985 444.1
Eastern Europe	2,085 101.1	2,115 102.6	2,110 102.4
China	1,835 91.1	1,770 88.0	1,705 84.8
Total Eastern Hemisphere	**40,205** **1,969.7**	**38,850** **1,900.4**	**37,875** **1,849.1**
World excl. U.S.S.R. & China & E. Europe	51,580 2,501.1	49,000 2374.8	47,045 2,270.4
World Total	**64,425** **3,134.3**	**61,705** **3,001.4**	**59,845** **2,901.7**

Source: British Petroleum
South Asia—Afghanistan, Bangladesh, Burma, India, Pakistan, Sri Lanka Southeast Asia—Brunei, Malaysia, Kampuchea, Indonesia, Hong Kong, Korea, Laos, Philippines, Singapore, Thailand, Taiwan, Viet Nam Australasia—Australia, Papua New Guinea, New Zealand, SW Islands

Worldwide refining capacity

EUROPE

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1970	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Austria	...	26	47	98	220	220	280	280	280	280	280	280	244	269
	...	1.3	2.3	4.9	11.0	11.0	13.9	13.9	13.9	13.9	13.9	13.9	12.1	13.4
Belgium	12	16	171	699	817	867	946	1,095	1,067	972	1,064	1,056	1,035	693
	0.6	0.8	8.5	34.8	40.7	43.2	47.1	54.5	53.1	48.4	53.0	52.6	51.4	34.4
Cyprus	...	...	...	...	15	15	15	15	15	15	16	16	14	16
	...	...	...	...	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.8
Denmark	1	1	...	173	227	220	226	226	220	215	214	215	215	215
	...	...	...	8.6	11.3	11.0	11.3	11.3	11.0	10.7	10.7	10.7	10.7	10.7
Finland	...	...	25	176	186	196	336	336	336	336	336	336	299	299
	...	...	1.2	8.8	9.3	9.8	16.7	16.7	16.7	16.7	16.7	16.7	14.8	14.8
France	152	306	769	2,405	3,140	3,342	3,312	3,517	3,456	3,469	3,385	3,342	3,291	2,471
	7.6	15.2	38.3	119.8	156.4	166.4	164.9	175.1	172.1	172.6	168.6	166.4	163.4	142.5
Germany, Fed. Rep.	48	81	573	2,351	2,826	2,987	3,103	3,075	3,081	3,103	2,986	3,021	2,937	2,471
	2.4	4.0	28.5	117.1	140.7	148.8	154.5	153.1	153.4	154.5	148.7	150.4	145.8	122.7
Greece	...	...	30	95	314	411	420	407	407	411	431	428	427	422
	...	...	1.5	4.7	15.6	20.5	20.9	20.3	20.3	20.5	21.5	21.3	21.2	20.9
Ireland	11	...	40	54	58	56	56	56	56	56	56	56	56	56
	0.5	...	2.0	2.7	2.9	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Italy	41	107	773	3,214	3,882	3,953	4,082	4,259	4,226	4,196	4,131	4,092	4,003	3,283
	2.0	5.3	38.5	160.1	193.3	196.9	203.3	212.1	210.4	209.0	205.7	203.7	198.7	163.0
Netherlands	15	77	359	1,456	1,826	1,841	1,985	2,031	1,869	1,857	1,828	1,827	1,708	1,552
	0.7	3.8	17.9	72.5	90.9	91.7	98.8	101.1	93.1	92.5	91.0	91.0	84.8	77.0
Norway	1	1	2	113	168	168	259	259	264	264	264	253	243	243
	...	...	0.2	5.6	8.4	8.4	12.9	12.9	13.1	13.1	13.1	12.6	12.1	12.1
Portugal	4	8	23	82	110	110	190	190	415	361	378	341	365	365
	0.2	0.4	1.1	4.1	5.5	5.5	9.5	9.5	20.7	18.0	18.8	17.0	18.1	18.1
Spain	2	6	146	728	1,163	1,165	1,323	1,277	1,271	1,425	1,456	1,464	1,517	1,522
	0.1	0.3	7.3	36.2	57.9	58.0	65.9	63.6	63.3	71.0	72.5	72.9	75.3	75.6
Sweden	4	26	48	253	248	248	413	434	424	411	458	451	471	453
	0.2	1.3	2.4	12.6	12.4	12.4	20.6	21.6	21.1	20.5	22.8	22.5	23.4	22.5
Switzerland	...	...	...	106	140	138	138	137	137	137	137	102	137	137
	...	...	...	5.3	7.0	6.9	6.9	6.8	6.8	6.8	6.8	5.1	6.8	6.8
United Kingdom	133	197	962	2,420	2,762	2,783	2,889	3,014	2,911	2,527	2,527	2,629	2,482	2,260
	6.6	9.8	47.9	120.5	137.5	138.6	143.9	150.1	145.0	125.8	125.8	130.9	123.2	112.1
Yugoslavia	5	8	10	228	288	288	280	249	293	293	296	297	297	297
	0.2	0.4	0.5	11.3	14.3	14.3	13.9	12.4	14.6	14.6	14.7	14.8	14.8	14.8
Total Europe	**429**	**860**	**3,978**	**14,651**	**18,390**	**19,008**	**20,253**	**20,857**	**20,728**	**20,328**	**20,243**	**20,206**	**19,741**	**17,424**
	21.1	**42.6**	**198.1**	**729.6**	**915.8**	**946.9**	**1,008.5**	**1,038.5**	**1,032.1**	**1,012,1**	**1,007.9**	**1,006.1**	**979.9**	**867.6**

AFRICA

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1970	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Algeria	...	...	...	47	115	115	122	122	122	122	122	122	122	137
	...	...	...	2.3	5.7	5.7	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.8
Angola	...	...	2	20	25	36	35	32	32	32	36	31	32	32
	...	...	0.1	1.0	1.2	1.8	1.7	1.6	1.6	1.6	1.8	1.5	1.6	1.6
Egypt	17	39	87	193	180	180	180	236	234	251	234	292	292	341
	0.8	1.9	4.3	9.6	9.0	9.0	9.0	11.8	11.7	12.5	11.6	14.5	14.5	16.9
Ghana	...	...	...	29	25	28	28	26	26	26	26	26	27	27
	...	...	...	1.4	1.2	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Ivory Coast	...	...	...	19	44	44	40	41	39	39	50	50	50	90
	...	...	...	0.9	2.2	2.2	2.0	2.0	1.9	2.0	2.5	2.5	2.5	4.5
Kenya	...	...	...	44	48	48	86	86	95	95	95	95	79	79
	...	...	...	2.2	2.4	2.4	4.3	4.3	4.7	4.7	4.7	4.7	3.9	3.9
Libya	...	...	...	10	16	76	76	135	135	137	138	142	130	130
	...	...	...	0.5	0.8	3.8	3.8	6.7	6.7	6.8	6.9	7.1	6.5	6.5
Morocco	...	...	2	35	59	59	68	68	72	72	72	72	72	74
	...	...	0.1	1.7	2.9	2.9	3.4	3.4	3.6	3.6	3.6	3.6	3.6	3.7
Mozambique	...	...	...	20	17	17	11	11	11	16	16	16	16	16
	...	...	...	1.0	0.8	0.8	0.5	0.5	0.5	0.8	0.8	0.8	0.8	0.8
Nigeria	...	...	...	40	60	60	57	60	60	159	160	160	254	260
	...	...	...	2.0	3.0	3.0	2.8	3.0	3.0	7.9	8.0	8.0	12.6	12.9
Senegal	...	...	...	13	18	15	12	19	20	20	20	20	18	18
	...	...	...	0.6	0.9	0.7	0.6	0.9	1.0	1.0	1.0	1.0	0.9	0.9
South Africa	1	...	25	178	331	397	434	433	446	478	478	469	424	424
	...	...	1.2	8.9	16.5	19.8	21.6	21.6	22.2	23.8	23.8	23.4	21.0	21.0
Sudan	...	...	...	20	22	22	24	24	24	26	26	24	24	24
	...	...	...	1.0	1.1	1.1	1.2	1.2	1.2	1.3	1.3	1.2	1.2	1.2
Tanzania	...	...	...	14	17	16	16	12	12	17	17	12	14	17
	...	...	...	0.7	0.8	0.8	0.8	0.6	0.6	0.8	0.8	0.6	0.7	0.8
Tunisia	...	...	...	23	21	25	23	22	22	34	34	34	34	34
	...	...	...	1.1	1.0	1.2	1.1	1.1	1.1	1.7	1.7	1.7	1.7	1.7
Zimbabwe	...	...	...	20	...	...	...	...	...	...	...	...	...	...
	...	...	...	1.0	...	...	...	...	...	...	...	...	...	...
Others	...	...	...	67	94	108	108	117	117	143	142	142	185	180
	...	...	...	3.3	4.7	5.4	5.4	5.8	5.8	7.1	7.1	7.1	9.2	8.9
Total	**18**	**39**	**116**	**792**	**1,092**	**1,246**	**1,320**	**1,444**	**1,467**	**1,667**	**1,668**	**1,707**	**1,773**	**1,882**
	0.8	**1.9**	**5.7**	**39.2**	**54.2**	**62.0**	**65.7**	**71.9**	**73.0**	**83.0**	**83.0**	**85.1**	**88.0**	**93.4**

NORTH AMERICA

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1970	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Canada	203	329	1,002	1,355	1,788	2,024	2,076	2,100	2,126	2,225	2,222	2,168	2,200	2,020
	10.1	16.4	49.9	67.5	89.0	100.8	103.4	104.6	105.9	110.8	110.6	107.9	109.2	100.3
United States	4,460	6,696	10,400	12,079	13,383	14,845	15,043	15,930	16,171	17,150	17,720	18,470	18,700	16,800
	222.1	333.5	517.9	601.5	666.5	739.3	749.1	793.3	805.3	854.1	882.5	919.6	928.3	834.0
Total	**4,663**	**7,025**	**11,402**	**13,434**	**15,171**	**16,869**	**17,119**	**18,030**	**18,297**	**19,375**	**19,942**	**20,638**	**20,900**	**18,820**
	232.2	**349.9**	**567.8**	**669.0**	**755.5**	**840.1**	**852.5**	**897.9**	**911.2**	**964.9**	**993.1**	**1,027.5**	**1,037.5**	**934.3**

LATIN AMERICA

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1970	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Argentina	103 5.1	152 7.6	238 11.9	562 25.0	624 31.1	721 35.9	684 34.1	703 35.0	655 32.6	655 32.6	676 33.7	679 33.8	677 33.6	676 33.5
Barbados	... ...	... ...	... ...	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1
Bolivia	1 ...	7 0.3	12 0.6	21 1.0	26 1.3	26 1.3	34 1.7	37 1.8	40 2.0	74 3.7	74 3.7	74 3.7	61 3.0	61 3.0
Brazil	4 0.2	12 0.6	156 7.8	575 28.6	792 39.4	962 47.9	986 49.1	1,118 55.7	1,161 57.8	1,209 60.2	1,205 60.0	1,402 69.8	1,407 69.8	1,219 60.5
Chile	1 ...	4 0.2	24 1.2	115 5.7	124 6.2	124 6.2	149 7.4	140 7.0	130 6.5	144 7.2	139 6.9	139 6.9	141 7.0	141 7.0
Colombia	15 0.7	24 1.2	51 2.5	140 7.0	166 8.3	172 8.6	172 8.6	165 8.2	165 8.2	174 8.7	193 9.6	199 9.9	199 9.9	214 10.6
Costa Rica	... ...	... ...	... ...	8 0.4	8 0.4	11 0.5	8 0.4	8 0.4	10 0.5	12 0.6	11 0.5	15 0.7	15 0.7	16 0.8
Cuba	4 0.2	7 0.3	87 4.3	93 4.6	122 6.1	122 6.1	122 6.1	122 6.1	122 6.1	160 8.0	160 8.0	160 8.0	160 8.0	160 8.0
Ecuador	2 0.1	5 0.2	7 0.3	37 1.8	35 1.7	44 2.2	44 2.2	41 2.0	96 4.8	93 4.6	86 4.3	87 4.3	90 4.3	79 3.9
El Salvador	... ...	... ...	... ...	14 0.7	14 0.7	14 0.7	16 0.8	16 0.8	17 0.8	17 0.8	16 0.8	16 0.8	16 0.8	16 0.8
Guatemala	... ...	... ...	... ...	21 1.0	26 1.3	26 1.3	25 1.2	14 0.7	14 0.7	14 0.7	16 0.8	16 0.8	16 0.8	16 0.8
Honduras	... ...	... ...	... ...	10 0.5	14 0.7	15 0.7	14 0.7	14 0.7	14 0.7	14 0.7	14 0.7	14 0.7	14 0.7	14 0.7
Jamaica	... ...	... ...	... ...	28 1.4	33 1.6	33 1.6	33 1.6	33 1.6	33 1.6	33 1.6	34 1.7	22 1.1	22 1.1	36 1.8
Mexico	98 4.9	160 8.0	337 17.8	515 25.6	625 31.1	760 37.8	760 37.8	935 46.6	1,384 68.9	1,244 61.9	1,394 69.4	1,394 69.4	1,470 73.0	1,289 64.0
Netherlands Antilles	495 24.6	617 30.7	680 33.9	795 39.6	945 47.1	900 44.8	849 42.3	810 40.3	842 41.9	842 41.9	792 39.4	782 38.9	782 38.9	782 38.9
Nicaragua	... ...	... ...	... ...	21 1.0	13 0.6	13 0.6	13 0.6	15 0.7	15 0.7	15 0.7	14 0.7	14 0.7	14 0.7	14 0.7
Panama	... ...	... ...	... ...	140 7.0	75 3.7	100 5.0	100 5.0	100 5.0	100 5.0	100 5.0	100 5.0	100 5.0	100 5.0	100 5.0
Paraguay	... ...	... ...	... ...	5 0.2	5 0.2	5 0.2	5 0.2	5 0.2	5 0.2	5 0.2	7 0.3	8 0.4	8 0.4	8 0.4
Peru	22 1.1	35 1.7	49 2.4	104 5.2	107 5.3	130 6.5	130 6.5	116 5.8	171 8.5	171 8.5	170 8.5	169 8.4	162 8.0	168 8.3
Puerto Rico	... ...	... ...	84 4.2	155 7.7	308 15.3	283 14.1	283 14.1	283 14.1	284 14.1	284 14.1	284 14.1	284 14.1	284 14.1	123 6.1
Trinidad & Tobago	49 2.4	104 5.2	182 9.1	417 20.8	461 23.0	461 23.0	461 23.0	461 23.0	461 23.0	461 23.0	456 22.7	456 22.7	456 22.7	375 18.6
Uruguay	5 0.2	16 0.8	28 1.4	40 2.0	43 2.1	43 2.1	46 2.3	46 2.3	43 2.1	43 2.1	40 2.0	40 2.0	45 2.2	45 2.2
Venezuela	55 2.7	254 12.6	886 44.1	1,324 65.9	1,532 76.3	1,532 76.3	1,451 72.3	1,446 72.0	1,446 72.0	1,446 72.0	1,446 72.0	1,349 67.2	1,323 65.7	1,284 63.7
Virgin Islands	... ...	... ...	... ...	220 11.0	590 29.4	590 29.4	728 36.2	728 36.2	728 36.2	728 36.2	728 36.2	728 36.2	640 31.8	600 29.8
Others	... ...	... ...	... ...	31 1.5	577 28.7	572 28.5	574 28.6	546 27.2	558 27.8	560 27.9	562 28.0	562 28.0	559 27.7	577 28.6
Total	**654** **42.2**	**1,397** **68.4**	**2,841** **141.5**	**5,334** **265.3**	**7,288** **361.7**	**7,661** **381.4**	**7,680** **382.9**	**7,905** **393.5**	**8,487** **422.8**	**8,501** **423.0**	**8,620** **429.1**	**8,712** **433.8**	**8,684** **430.0**	**8,016** **398.2**

WORLDWIDE refining capacity continues to shrink.

MIDDLE EAST

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1970	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Bahrain	33 1.6	150 7.5	187 9.3	265 13.2	250 12.4	250 12.4	250 12.4	250 12.4	250 12.4	250 12.4	250 12.4	250 12.4	250 12.4	250 12.4
Iran	333 16.6	502 25.0	495 24.6	702 35.0	660 32.9	789 39.3	781 38.9	780 38.8	910 45.3	921 45.9	921 45.9	1,121 55.8	530 26.3	530 26.3
Iraq	4 0.2	9 0.4	56 2.8	83 4.1	99 4.9	169 8.4	169 8.4	168 8.4	168 8.4	168 8.4	168 8.4	168 8.4	169 8.4	169 8.4
Israel	... ...	83 4.1	87 4.3	115 5.7	212 10.6	201 10.0	181 9.0	201 10.0	201 10.0	195 9.7	195 9.7	190 9.5	190 9.5	190 9.5
Kuwait	... ...	25 1.2	220 11.0	489 24.3	646 32.2	646 32.2	685 34.1	684 34.1	712 35.5	712 35.5	645 32.1	645 32.1	623 30.9	623 30.9
Lebanon	... ...	6 0.3	24 1.2	37 1.8	54 2.7	54 2.7	54 2.7	... ...	53 2.6	53 2.6	53 2.6	52 2.6	52 2.6	52 2.6
Neutral Zone	... ...	... ...	50 2.5	80 4.0	(†) ...	(†) ...	(†) ...	(†) ...	(†) ...	(†) ...	(†) ...	(†) ...	(†) ...	(†) ...
Saudi Arabia	... ...	140 7.0	189 9.4	465 23.2	428 21.3	610 30.4	537 26.7	630 31.4	586 29.2	487 24.2	487 24.2	487 24.2	487 24.2	705 35.0
Syria	... ...	... ...	... ...	54 2.7	51 2.5	51 2.5	117 5.8	116 5.8	102 5.1	223 11.1	223 11.1	223 11.1	223 11.1	229 11.4
Turkey	... ...	1 ...	7 0.3	209 10.4	306 15.2	316 15.7	316 15.7	325 16.2	326 16.2	338 16.8	356 17.7	356 17.7	367 18.2	467 23.1
Yemen (P.D.R.)	... ...	... ...	120 6.0	178 8.9	162 8.1	169 8.4	169 8.4	169 8.4	143 7.1	143 7.1	175 8.7	175 8.7	178 8.8	178 8.8
Others	... ...	... ...	1 ...	9 0.4	15 0.7	28 1.4	29 1.4	48 2.4	55 2.7	56 2.8	45 2.2	63 3.1	233 11.6	293 14.5
Total	**370** **18.4**	**916** **45.5**	**1,436** **71.4**	**2,686** **133.7**	**2,883** **143.5**	**3,283** **163.4**	**3,288** **163.5**	**3,371** **167.9**	**3,506** **174.5**	**3,546** **176.5**	**3,518** **175.0**	**3,731** **185.6**	**3,302** **163.9**	**3,685** **182.9**

†Included in Kuwaiti figures.

ASIA-PACIFIC

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1970	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Australia	4 0.2	14 0.7	237 11.8	581 28.9	681 33.9	722 36.0	707 35.2	706 35.2	709 35.3	708 35.3	725 36.1	743 37.0	742 36.8	716 35.5
Bangladesh	... ...	... ...	... ...	... ...	31 1.5	31 1.5	31 1.5	31 1.5	31 1.5	31 1.5	31 1.5	31 1.5	31 1.5	31 1.5
Brunei-Malaysia-Singapore	10 0.5	10 0.5	46 2.3	302 15.0	823 41.0	969 48.3	1,001 49.8	1,085 54.0	1,086 54.1	1,058 52.7	1,093 54.4	1,246 62.0	1,271 63.1	1,271 63.1
India	10 0.5	6 0.3	112 5.6	436 21.7	499 24.9	555 27.6	564 28.1	567 28.2	564 28.1	626 31.2	557 27.7	557 27.7	557 27.7	753 37.4
Indonesia	170 8.5	203 10.1	274 13.6	268 13.3	428 21.3	428 21.3	428 21.3	428 21.3	528 26.3	528 26.3	528 26.3	445 22.2	498 24.7	341 16.9
Japan	53 2.6	34 1.7	640 31.9	2,796 139.2	4,940 246.0	5,134 255.7	5,417 269.8	5,552 276.5	5,467 272.2	5,480 272.9	5,509 274.3	5,454 271.6	5,601 278.0	5,548 275.4
Korea, South	... ...	... ...	... ...	175 8.7	420 20.9	425 21.2	435 21.7	424 21.1	475 23.6	542 27.0	601 29.9	607 30.2	755 37.5	755 37.5
Pakistan	... ...	5 0.2	6 0.3	115 5.7	81 4.0	79 3.9	74 3.7	74 3.7	106 5.3	110 5.5	98 4.9	122 6.1	133 6.6	133 6.6
Philippines	... ...	... ...	22 1.1	180 9.0	284 14.1	274 13.6	247 12.3	251 12.5	253 12.6	253 12.6	253 12.6	246 12.2	286 14.2	286 14.2
Taiwan	... ...	... ...	28 1.4	129 6.4	210 10.5	244 12.1	335 16.7	425 21.2	425 21.2	425 21.2	425 21.2	515 25.6	515 25.6	515 25.6
Thailand	... ...	... ...	1 ...	62 3.1	166 8.3	166 8.3	166 8.3	161 8.0	160 8.0	160 8.0	186 9.3	186 9.3	176 8.7	176 8.7
Others	27 1.3	4 0.2	9 0.4	137 6.8	371 18.5	371 18.5	374 18.6	369 18.4	373 18.6	364 18.1	380 18.9	402 20.0	420 20.8	377 18.7
Total	274 13.6	276 13.7	1,375 68.4	5,181 257.8	8,934 444.9	9,398 468.0	9,779 487.0	10,073 501.6	10,177 506.8	10,285 512.3	10,386 517.1	10,554 525.5	10,985 545.3	10,902 541.1
Total, exclu. U.S.S.R., China, E. Europe	6,608 328.3	10,513 523.0	21,148 1,052.9	42,078 2,094.6	53,738 2,675.6	57,465 2,861.8	59,449 2,960.1	61,680 3,071.3	62,672 3,120.4	63,702 3,171.8	64,375 3,205.2	65,548 3,263.4	65,365 3,244.7	60,729 3,024.0

U.S.S.R.-EASTERN EUROPE-CHINA

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1970	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
China	... ...	8 0.4	98 4.9	300 14.9	600 29.9	850 42.3	1,014 50.5	1,398 69.6	1,400 69.7	1,578 78.6	1,600 79.7	1,810 90.1	1,810 90.1	2,000 100.0
Czechoslovakia	... ...	16 0.8	46 2.3	220 11.0	346 17.2	354 17.6	374 18.6	404 20.1	413 20.6	445 22.2	455 22.7	455 22.7	455 22.7	455 22.7
Hungary	... ...	20 1.0	58 2.9	130 6.5	210 10.5	212 10.6	223 11.1	230 11.5	226 11.3	230 11.5	290 14.4	312 15.5	312 15.5	311 15.5
Poland	... ...	4 0.2	20 1.0	156 7.8	276 13.7	280 13.9	326 16.2	366 18.2	370 18.4	380 18.9	385 19.2	385 19.2	385 19.2	385 19.2
Romania	... ...	182 9.1	260 12.9	356 17.7	442 22.0	452 22.5	462 23.0	490 24.4	508 25.3	533 26.5	608 30.3	617 30.7	617 30.7	617 30.8
U.S.S.R.	... ...	900 44.8	2,800 139.4	5,640 280.9	7,810 388.9	8,240 410.3	9,225 459.4	9,500 473.1	9,785 487.3	10,478 521.8	10,950 545.3	11,400 567.6	11,600 575.8	11,750 587.5
Others	... ...	4 0.2	40 2.0	332 16.5	350 17.4	375 18.7	726 36.1	800 39.8	810 40.3	823 41.0	852 42.4	852 42.4	852 42.4	898 44.7
Total	... ...	1,134 58.5	3,322 165.4	7,134 355.3	10,034 499.6	10,763 535.9	12,350 614.9	13,188 656.7	13,512 672.9	14,467 720.5	15,140 754.0	15,831 788.2	16,031 798.8	16,416 817.4
World total	6,608 328.3	11,647 579.5	24,470 1,218.3	49,212 2,449.9	63,772 3,175.2	68,228 3,397.7	71,799 3,575.0	74,868 3,728.0	76,184 3,793.3	78,169 3,892.3	79,513 3,959.2	81,379 4,039.7	81,396 4,040.5	77,145 3,841.5

Refining survey

YOUR USE OF THE INTERNATIONAL REFINING SURVEY MAY BE aided by the following information:

All country by country volumes are presented in calendar day figures except U.S. and Canada. In that tabulation, only crude is reported in calendar day— cat cracking and cat reforming are given in stream day.

Where a U.S. or Canadian company reports all their volumes in calendar day a conversion is necessary to arrive at stream day figures for cat cracking and cat reforming to keep totals consistent. Dividing calendar day by 0.90 makes the conversion.

This explains what may appear to be discrepancies in the addition of some columns.

NR means Not Reported. When this term appears in the crude column, the total reflects conversion from a stream day to a calendar day basis to ensure each column is complete. This is done by multiplying 0.95 as the conversion factor.

Calendar-day figures are the average volume a refinery unit processes each day including downtime used for turnarounds. This is actual total volume for the year divided by 365.

Stream-day figures represent the amount a unit can process when running full capacity for short periods.

LEGEND

CAT CRACKING
1. Fluid
2. Thermofor
3. Houdriflow

CAT REFORMING
Semiregenerative:
1. Conventional catalyst
2. Bimetallic catalyst

Cyclic:
3. Conventional catalyst
4. Bimetallic catalyst

Other:
5. Conventional catalyst
6. Bimetallic catalyst

Cat reforming definitions are:

Semiregenerative. Characterized by shutdown to the reforming unit at specified intervals or at the operator's convenience for regeneration of catalyst in situ.

Cyclic. Characterized by continuous or continual regeneration of catalyst in situ in any one of several reactors that can be isolated from and returned to the reforming operation. This is accomplished without changing feed rate or octane.

Other includes:

Nonregenerative—catalyst replaced by fresh catalyst

Continuous—continuous regeneration of a part of the catalyst in a special regenerator followed by continuous addition to the reactor

Moving-bed catalyst systems.

INACTIVE REFINERIES:

1. Amoco Oil Co., Sugar Creek, Mo.—104,000 b/cd.
2. Amoco Oil Co., Baltimore, Md.—15,000 b/cd.
3. Ashland Petroleum Co., Tonawanda, N.Y.—60,000 b/cd.
4. Brio Refining Inc., Houston, Tex.—16,000 b/cd.
5. Caribou Four Corners Inc., Kirtland, N.M.—2,750 b/cd.
6. Cibro Petroleum Products Inc., Albany, N.Y.—42,500 b/cd.
7. Clinton Manges Oil & Refining Co., Tucker, Tex.—9,700 b/cd.
8. Coastal Petroleum Inc., Bakersfield, Calif.—15,000 b/sd.
9. Copano Refining, Ingleside, Tex.—10,000 b/sd.
10. CRA Inc., Scottsbluff, Neb.—5,600 b/cd (dismantled).
11. CRA Inc., Phillipsburg, Kans.—26,400 b/cd.
12. Crystal Oil Co., Longview, Tex.—14,000 b/cd.
13. Erickson Refining Co., Port Neches, Tex.—45,000 b/cd.
14. Evangeline Refining Cl, Jennings, La.—5,000 b/sd.
15. GHR Energy Corp., Good Hope, La.—300,000 b/sd.
16. Hudson Refining Cl, Cushing, Okla.—19,000 b/cd.
17. Husky Oil Co., Cody, Wyo.—11,500 b/cd.
18. Independent Refining Corp., Winnie, Tex.—50,000 b/cd.
19. Industrial Fuel and Asphalt, Hammond, Ind.—9,400 b/cd.
20. International Processors, St. Rose, La.—28,500 b/cd.
21. Lake Charles Refining Co., Lake Charles, La.—32,000 b/cd.
22. LaJet Inc., St. James—40,000 b/cd.
23. Listo Petroleum, Donna, Tex.—3,656 b/cd.
24. Lunday-Thagard Oil Co., South Gate, Calif.—15,000 b/cd.
25. Macmillan Ring-Free Oil Cl, Signal Hill, Calif.—13,000 b/cd.
26. Okmulgee Refining Co., Okmulgee, Okla.—24,000 b/cd.
27. Osceola Refining Co., West Branch, Mich.—12,000 b/cd.
28. Pennzoil Co., Falling Rock, W. Va.—5,600 b/cd.
29. Phillips Petroleum Co., Kansas City, Kans.—80,000 b/cd.
30. Pioneer Refining Ltd., Nixon, Tex.—5,100 b/cd.
31. Placid Refining Co., Mt. Belvieu, Tex.—12,400 b/cd.
32. Quitman Refining Co., Quitman, Tex.—6,500 b/cd.
33. Sage Creek Refining Co., Cowley, Wyo.—1,000 b/cd.
34. San Joaquin Refining Cl—25,550 b/cd.
35. Schulze Processing Inc., Talla Bena, La.—1,768 b/cd.
36. Seminole Refining Inc., St. Marks, Fla.—13,000 b/cd.
37. Sentry Refining Inc., Corpus Christi, Tex.—20,000 b/sd.
38. Silver Eagle Oil Inc., LaBarge, Wyo.—3,000 b/cd.
39. Sooner Refining Cl, Egan, La.—8,000 b/cd.
40. Texas Armada Refining Co., Fort Worth, Tex.—5,000 b/cd.
41. Texaco Inc., Casper, Wyo.—21,000 b/cd.
42. Texaco Inc., Tulsa, Okla.—50,000 b/cd.
43. Texaco Canada Inc., Montreal, Quebec.—74,500 b/cd.
44. Thriftway Inc., Graham, Tex.—2,400 b/cd.
45. Tipperary Corp., Ingleside, Tex.—10,400 b/cd.
46. T&S Refining Inc., Jennings, La.—10,200 b/cd.
47. Vulcan Refining Co., Cordova, Ala.—10,500 b/cd.
48. Vicksburg Refining Inc., Vicksburg, Miss.—5,500 b/cd.
49. West Coast Oil Co., Oildale, Calif.—21,000 b/cd.

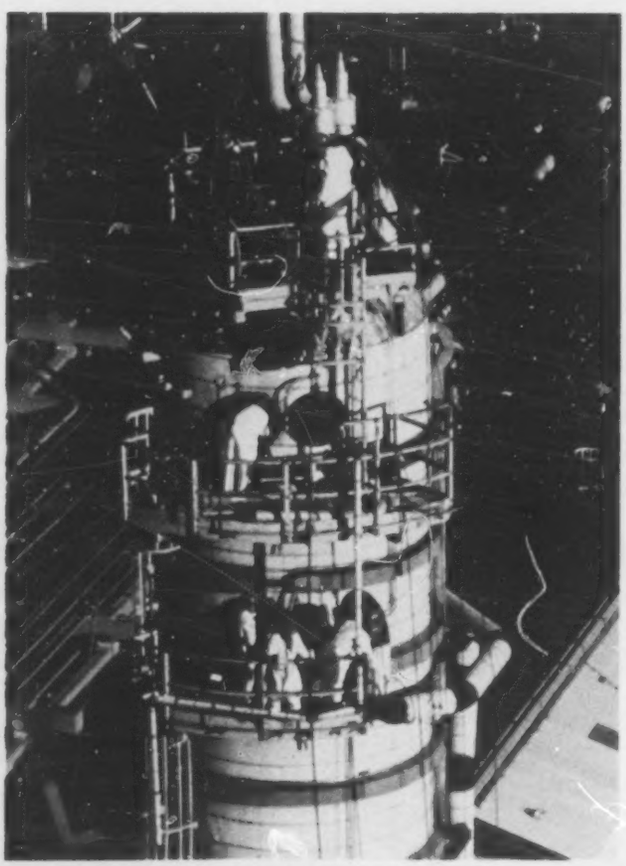
Survey of operating refineries worldwide

(capacities of January 1, 1983)

Country	No. plants	Crude b/cd	Catalytic cracking	Catalytic reforming
Abu Dhabi	2	135,000	....	21,950
Algeria	4	137,400	....	23,600
Angola	1	32,100	....	1,900
Antigua	1	17,500	....	3,000
Argentina	12	675,700	98,500	37,700
Australia	12	715,600	166,800	172,500
Austria	1	268,500	19,300	28,200
Bahamas	1	500,000	....	....
Bahrain	1	250,000	34,200	17,100
Bangladesh	1	31,200	....	1,720
Barbados	1	3,000	....	....
Belgium	5	692,600	90,900	92,400
Bolivia	3	60,700	....	12,900
Brazil	13	1,219,000	277,000	21,600
Burma	2	26,300	....	....
Cameroon	1	43,000	....	6,500
Chile	2	141,000	34,000	9,300
China, Taiwan	2	515,410	9,040	52,440
Colombia	5	213,500	77,000	6,000
Costa Rica	1	15,700	....	1,500
Cyprus	1	15,500	....	3,000
Denmark	3	215,000	....	37,900
Dominican Republic	2	48,000	....	8,300
Ecuador	3	78,857	11,389	2,513
Egypt	6	340,650	....	10,800
El Salvador	1	16,300	....	2,800
Ethiopia	1	14,430	....	1,890
Finland	2	299,000	37,500	48,000
France	20	2,871,000	244,500	387,000
Gabon	1	20,000	....	1,400
Germany	27	2,471,300	177,900	388,550
Ghana	1	26,600	....	6,175
Greece	4	422,000	23,000	30,300
Guam	1	43,700	....	....
Guatemala	1	16,000	....	3,000
Honduras	1	14,000	....	1,800
Hungary	5	311,500	....	30,100
India	12	752,694	74,350	15,060
Indonesia	9	341,300	11,500	22,800
Iran	4	530,000	....	63,345
Iraq	7	168,500	....	5,000
Ireland	1	56,000	....	14,500
Israel	2	190,000	15,000	24,300
Italy	28	3,283,407	259,200	348,300
Ivory Coast	2	90,075	....	14,600
Jamaica	1	35,500	....	3,500
Japan	45	4,548,400	430,400	570,850
Jordan	1	100,000	4,410	8,640
Kenya	1	79,000	....	8,500
Korea	6	754,500	....	36,550
Kuwait	5	623,000	....	47,120
Lebanon	2	52,000	7,250	7,292
Liberia	1	15,000	....	2,000
Libya	2	129,500	....	14,500
Madagascar	1	16,350	....	2,600
Malaysia	3	175,000	....	10,300
Martinique	1	11,000	....	2,500
Mexico	9	1,289,000	298,000	163,800
Morocco	2	74,000	....	8,623
Mozambique	1	16,000	....	....
Netherlands	7	1,551,500	111,000	187,900
Netherlands Antilles	2	782,000	42,000	15,000
New Zealand	1	74,000	....	24,000
Nicaragua	1	14,400	....	2,850
Nigeria	3	260,000	47,000	23,500
Norway	4	242,700	....	29,000
Okinawa	3	183,000	....	11,600
Oman	1	45,890	....	9,178
Pakistan	3	133,100	....	5,210
Panama	1	100,000	....	7,500
Paraguay	1	7,500	....	....
Peru	5	168,459	37,290	1,640
Philippines	3	286,000	23,100	40,200
Portugal	2	364,882	....	54,047
Puerto Rico	2	123,000	12,000	6,000
Qatar	1	11,753	....	1,650
Saudi Arabia	3	705,000	....	....
Senegal	1	18,000	....	1,900
Sierra Leone	1	10,000	....	....
Singapore	5	1,096,000	....	39,000
Somalia	1	10,000	....	....
South Africa	4	423,500	82,500	62,000
Spain	10	1,522,000	25,000	195,700
Sri Lanka	1	50,000	....	3,750
Sudan	1	24,000	....	2,100
Sweden	6	452,800	....	80,900
Switzerland	2	137,300	....	25,000
Syria	2	228,790	....	19,348
Tanzania	1	17,000	....	4,200
Thailand	3	176,000	8,800	25,100
Togo	1	20,000	....	4,400
Trinidad	2	375,000	25,000	27,000
Tunisia	1	34,000	....	3,300
Turkey	4	467,400	41,260	43,875
United Kingdom	16	2,259,500	267,250	399,150
Uruguay	1	45,000	5,000	3,000
Venezuela	7	1,283,700	177,900	7,500
Virgin Islands	1	600,000	....	125,000
Yemen, S.	1	178,000	....	12,000
Yugoslavia	7	297,007	1,960	45,156
Zaire	1	17,000	....	3,500
Zambia	1	24,500	....	5,600
Total	**42**	**42,066,954**	**3,308,199**	**4,426,772**

Country-by-country refining survey

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
ABU DHABI			
Abu Dhabi National Oil Co.–Ruwais	120,000	....	[2]19,150
			[7]20,780
			[7]20,850
Umm Al Nar	15,000	....	[2]2,800
Total	**135,000**	**....**	**21,950**
ALBANIA			
Government-owned refineries at Ballsh, Cerrik, Stalin.			
Total	**[1]40,000**		
ALGERIA			
Sonatrach: Arzew	60,000	....	8,600
Hassi Messaoud	2,400	....	....
Maison Carree	60,000	....	15,000
Skikda	15,000	....	....
Total	**137,400**	**....**	**23,600**
ANGOLA			
Petrangol SARL–Luanda	32,100	....	[1]1,900
ANTIGUA			
West Indies Oil CL–			
St. John's	17,500	....	[2]3,000
			[4]5,400
Total	**17,500**	**....**	**3,000**
ARGENTINA			
Astrasur, Refinerías Patagónicas de			
Petróleo SA–Comodoro Rivadavia	6,300	....	....
			[3]2,800



SUNCOR Inc.'s 85,000-b/d refinery at Sarnia, Canada.

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
Destileria Argentina de Petróleo SA–			
Lomas de Zamora	2,000	....	....
Esso SAPA–Campana	93,400	[1]22,500	[1]7,700
Galvan	17,000	....	....
Isaura SA–Bahia Blanca	12,000	....	....
Shell Cia. Argentina de Petróleo SA–			
Buenos Aires	115,000	19,000	9,500
Yacimientos Petroliferos Fiscales–			
Campo Duran	32,000	....	....
Dock Sud	4,000	....	....
Ensenada	216,000	[1]41,000	9,000
Lujan de Cuyo	120,000	[1]16,000	9,000
Plaza Huincul	23,000	....	2,500
San Lorenzo	35,000	....	....
Total	**675,700**	**98,500**	**37,700**
AUSTRALIA			
Amoco Australia PL–Bulwer Island	41,500	[1]11,000	[2]8,500
Ampol Refineries Ltd.–Lytton	58,000	[1]26,000	[1]13,000
			[2]3,200
Australian Oil Refinery PL–Kurnell	129,000	[1]37,000	[2]25,300
Australian Lubricating Oil Refinery			
Ltd.–Kurnell	....	....	....
BP Australia–Kwinana	100,000	[1]19,800	[1]3,000
			[2]13,000
Westernport	57,000	....	[2]16,000
Mobil Oil Australia Ltd.–Adelaide	....	....	....
Petroleum Refineries Australia PL–			
Adelaide	46,500	....	[2]16,000
Altona	98,600	[2]24,000	[2]28,000
Shell Refining (Australia) PL.–Clyde	69,000	24,000	16,500
Geelong	[1]06,000	[1]25,000	30,000
Total Refineries Australia Ltd.–			
Matraville	10,000	....	....
Total	**715,600**	**166,800**	**172,500**
AUSTRIA			
OeMV–Schwe[illegible]	268,500	[1]19,300	[2]14,200
			[4]14,000
Total	**268,500**	**19,300**	**28,200**
BAHAMAS			
Bahamas Oil Refining Co.–Freeport	500,000	....	....
BAHRAIN			
Bahrain Petroleum Co. BSC (Closed)			
–Awali	250,000	[1]34,200	[2]17,100
Total	**250,000**	**34,200**	**17,100**
BANGLADESH			
Eastern Refinery Ltd.–Chittagong	31,200	....	[1]1,720
Total	**31,200**	**....**	**1,720**
BARBADOS			
Mobil Oil Barbados Ltd.–Bridgetown	3,000	....	....
BELGIUM			
Belgian Refining Corp. NV–Antwerp	108,500	....	[7]12,000
Belgian Shell NV–Ghent	8,600	....	....
Belgische Petroleum Raff.			
NV–Antwerp	75,500	....	[2]20,500
SA Esso NV–Antwerp	194,000	[1]24,700	[4]29,700
SIBP NV–Antwerp	306,000	[1]66,200	[2]30,200
Total	**692,600**	**90,900**	**92,400**

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
BOLIVIA			
Yacimientos Petroliferos Fiscales Bolivianos–Cochabamba	43,000	....	[1]7,000
Santa Cruz	15,000	....	[2]5,900
Sucre	2,700	....	....
Total	**60,700**	**....**	**12,900**
BRAZIL			
Petróleo Brasileiro SA: Araucária, Paraná[1]	144,800	[1]37,000	....
Betim, Minas Gerais	60,300	[1]13,600	....
Canoas, Rio Grande do Sul	60,300	[1]13,100	....
Cubatão, São Paulo	133,300	[1]48,300	[1]10,200
Duque de Caxias, Rio de Janeiro[2]	217,100	[1]34,100	[1]11,400
Fortaleza, Ceará	4,200	....	....
Manaus, Amazonas	7,800	[1]1,800	....
Mataripe, Bahia[3]	119,400	[1]20,800	....
Mauá, Santo André, São Paulo	27,200	[2]14,400	....
Paulínia, São Paulo	277,500	[1]39,800	....
São José dos Campos, São Paulo	147,800	[1]51,600	....
Refinaria de Petróleo Ipiranga SA–Rio Grande do Sul	9,300	[1]2,500	....
Refinaria de Petroleos de Manguinhos SA–Rio de Janeiro	10,000	....	....
Total	**1,219,000**	**277,000**	**21,600**

Solvent extraction: [1]26,200 b/d. [2]18,800 b/d (9,700 b/d for lubes). [3]3,400 (for lubes).
†Figures in BPH. Not included in totals.

BULGARIA			
Government-owned refineries at Burgas, Pleven, Ruse.			
Total	**300,000**		
BURMA			
Petrochemical Industries Corp.–Chauk	6,300	....	....
Syriam	20,000	....	....
Total	**26,300**	**....**	**....**
CAMEROON			
Sonara–Ste. Nationale de Raffinage–Pointe Limboh	43,000	....	[2]6,500
CHILE			
Petrox SA–Concepción	72,000	[1]20,000	[1]4,000
Refinería de Concón–Concón	69,000	[1]14,000	[1]5,300
Total	**141,000**	**34,000**	**9,300**
CHINA			
Government-owned refineries at Anshan, Chin-Hsi, Dairen, Fushun, Hangchow, Karamai-Tushantzu, Lanchow, Lenghu, Maoming, Nanchung, Nanking,			
Total	**1,810,000**		
CHINA, TAIWAN			
Chinese Petroleum Corp.–Kaohsiung	425,000	[2]9,040	[2]20,800 [6]18,080 [4]13,560
Tao-Yuan	90,410	....	[2]13,560
Total	**515,410**	**9,040**	**52,440**
COLOMBIA			
Empresa Colombiana de Petróleos –Barrancabermeja-Santander[1]	135,000	[1]62,000	[2]6,000
Cartagena, Bolivar	70,000	[1]15,000	....
Orito, Putumayo	1,000	....	....
Tibu, N. de Santander	5,000	....	....
Texas Petroleum Co.–El Guamo	2,500	....	....
Total	**213,500**	**77,000**	**6,000**

[1]Solvent extraction: 36,400 b/cd.

COSTA RICA			
Refinadora Costarricense de Petroleo SA–Limón	15,700	....	[3]1,500
Total	**15,700**	**....**	**1,500**

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
CUBA			
Government-owned refineries at Cabaiguan, Havana, Santiago de Cuba.			
Total	**160,000**		
CYPRUS			
Cyprus Petroleum Refinery Ltd.–Larnaca	15,500	....	[2]3,000
CZECHOSLOVAKIA			
Government owned refineries at Bratislava, Kolin, Kralupi, Pardubice, Strazke, Zaluzi, Zyolen.			
Total	**455,000**		
DENMARK			
AS Dansk Shell–Fredericia	59,000	....	13,000
Dansk Esso AS–Kalundborg	71,000	....	[2]7,800
Gulf Oil Refining AS–Skaelskor	85,000	....	[2]17,100
Total	**215,000**	**....**	**37,900**
DOMINICAN REPUBLIC			
Falconbridge Dominicana C por A–La Peguera	16,000	....	....
Refineria Dominicana de Petróleo SA–Nigua	32,000	....	8,300
Total	**48,000**	**....**	**8,300**
ECUADOR			
CEPE–Esmeraldas	50,282	[1]11,389	[1]2,513
Anglo–La Libertad	27,575	....	....
Texaco–Lago-Agrio	1,000	....	....
Total	**78,857**	**11,389**	**2,513**
EGYPT			
Alexandria Petroleum Co.–Alexandria (El-Mex)	105,300	....	....
El Nasr Petroleum Co.–Alexandria (El-Ameria)	57,600	....	....
Suez	51,750	....	....
Suez Oil Processing Co.–Mostorod	84,150	....	[2]10,800
Suez	18,900	....	....
Tanta	22,950	....	....
Total	**340,650**	**....**	**10,800**
EL SALVADOR			
Refinería Petrólera Acajutla SA–Acajutla	16,300	....	[1]2,800
Total	**16,300**	**....**	**2,800**
ETHIOPIA			
Ethiopian Petroleum SC–Assab	**14,430**	**....**	**1,890**
FINLAND			
Neste Oy–Naantali	56,000	[2]9,500	....
Porvoo	243,000	[1]28,000	[1]20,000 [2]28,000
Total	**299,000**	**37,500**	**48,000**
FRANCE			
Cie. Francaise de Raffinage–Gonfreville L'Orcher	315,000	[1]28,500	[2]49,500
La Mede	200,000	[1]30,000	[2]23,400 [4]17,600
Mardyck[1]	128,000	[1]23,000	[2]20,500
Cie. Rhénane de Raffinage–Reichstett-Vendenheim	86,000	....	12,000
Elf France–Ambes	....	[1]6,300	....
Donges	183,000	[1]13,000	[2]30,600
Feyzin	185,000	[1]15,500	[2]9,700
Gargenville	139,000	....	....
Grandpuits	100,000	[1]21,600	[2]15,000
Valenciennes	85,000	....	[2]14,500
Esso SAF–Ambes	57,000	....	[4]8,100
Fos sur Mer	170,000	[1]14,300	[4]25,700
Port Jerome	160,000	[1]18,300	[2]16,000

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
Mobil Oil Francaise–Frontignon	62,000	[2]17,000	[2]20,000
Notre Dame de Gravenchon	57,000	....	[2]17,000
Raffinerie de Strasbourg–Herrlisheim	92,000	....	[1]22,000
Shell Francaise–Berre l'Etang	209,000	19,000	15,000
Pauillac	92,000	[1]19,000	13,000
Petit Couronne	285,000	[1]19,000	41,000
Ste. Francaise des Petroles BP–Dunkirk	....	....	....
Lavera	174,000	....	[1]5,400
Vernon	72,000	....	[2]11,000
Total	**2,871,000**	**244,500**	**387,000**

[1]Solvent extraction 8,000 b/cd.

GABON

Ste. Gabonaise de Raffinage–Port Gentil	**20,000**	....	**1,400**

GERMANY, EAST

Government-owned			
Total	**470,000**		

GERMANY, WEST

Deutsche BP AG–Finkenwerder, Hamburg	59,000	....	[1]7,650
Vohburg	102,000	[1]16,000	[2]16,000
Deutsche Marathon Petroleum GmbH–Burghausen	70,000	....	....
Deutsche Shell AG–Godorf	180,000	....	27,000
Harburg-Grasbrook	86,000	[1]12,000	15,000
Monheim	8,000	....	....
Deutsche Texaco AG–Heide	105,000	[2]8,000	....
Elf Bitumenwerke GmbH–Brunsbuettel	7,500	....	....
Elf Gelsenberg–Speyer	140,000	....	[2]22,000
Erdol Raffinerie Duisburg GmbH–Duisburg	37,800	....	[2]7,300
Erdolraffinerie Ingolstadt AG–Ingolstadt, Donau	90,000	....	[2]30,000
Erdoel Raffinerie Neustadt GmbH–Neustadt-Donau	144,000	[1]22,700	[1]17,700
Erdölwerke Frisia–Emden	45,000	....	[2]6,000
Esso AG–Hamburg	110,000	[1]15,100	[2]13,600
Ingolstadt	100,000	[1]20,200	[2]13,600
Karlsruhe	160,000	....	[1]16,300 [2]13,600
Gewerkschaft Erdol-Raffinerie Deurag-Nerag–Misburg	45,000	....	7,000
Mobil Oil AG–Wilhelmshaven	160,000	....	[2]32,000
Worth	75,000	[1]15,000	[2]14,000
Oberrheinische Mineralolwerke GmbH–Karlsruhe	142,000	[1]52,000	[2]10,300 [6]19,700
Oelwerke Julius Schindler GmbH–Hamburg	8,800	....	....
Saarland-Raffinerie GmbH–Volklingen	78,000	....	....
Union Rheinische Braunkohlen Kraftstoff AG–Wesseling	95,000	....	[1]9,000
Veba Oel AG–Gelsenkirchen	215,400	[1]5,000	[1]11,900 [2]11,900
	[6]27,000		
Wintershall AG–Lingen	91,400	....	[1]7,400 [2]11,100 [4]15,000
Mannheim	111,300	....	[2]18,400
Salzbergen	5,100	....	....
Total	**2,471,300**	**177,900**	**388,550**

GHANA

Ghanaian Italian Petroleum CL–Tema	**26,600**	....	**[1]6,175**

GREECE

Hellenic Aspropyrgos Refinery SA–Aspropyrgos	110,000	....	[1]5,200 [2]9,500
Motor Oil (Hellas) Corinth Refineries SA–Aghii Theodori	140,000	[1]23,000	[1]8,500
Petrola Hellas SA–Eleusis	100,000	....	....
Thessaloniki Refining Co. AE–Thessaloniki	72,000	....	[2]7,100
Total	**422,000**	**23,000**	**30,300**

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
GUAM			
Guam Oil & Refining Co.–Apra Heights	**43,700**	....	....
GUATEMALA			
Texas Petroleum Co.–Escuintla	16,000	....	[2]3,000
Total	**16,000**	....	**3,000**
HONDURAS			
Refineria Texas de Honduras SA–Puerto Cortes	14,000	....	[1]1,800
Total	**14,000**	....	**1,800**
HUNGARY			
Dunai KV–Százhalombatta	196,000	....	[2]26,000
Komáromi KV–Komárom	32,500	....	[2]4,100
Tiszai KV: Leninváros	66,500	....	....
Nyirbogdány	6,500	....	....
Zalai KV–Zalaegerszeg	10,000	....	....
Total	**311,500**	....	**30,100**
INDIA			
Bharat Petroleum CL–Mahul, Bombay	105,432	[1]17,000	7,000
Bongaigaon Refineries & Petrochemical Ltd.–Bongaigaon	20,082	....	....
Cochin Refineries Ltd.–Kerala	66,271	....	5,660
Hindustan Petroleum CL–			
Mahul, Bombay	87,000	[1]9,000	....
Visakhapatnam	30,123	....	....
Indian Oil CL–Barauni	66,271	12,800	....
Digboi	10,041	....	....
Gauhati	17,070	6,000	....
Gujarat	146,600	7,000	....
Haldia	50,205	4,500	....
Mathura	97,599	[1]18,050	....
Madras Refineries Ltd.–Madras	56,000	....	[1]2,400
Total	**752,694**	**74,350**	**15,060**
INDONESIA			
Lemigas–Cepu, Central Java	600	....	....
Pertamina–Balikpapan, Kalimantan	55,000	....	....
Cilacap, Central Java	98,000	....	[5]11,900
Dumai, Central Sumatra	60,000	....	[2]3,720
Pangakalan Brandan, North Sumatra	5,000	....	....
Plaju, South Sumatra	49,500	....	[1]7,200
Sungai Gerong, South Sumatra	48,500	[1]11,500	....
Sungai Pakning, Central Sumatra	24,000	....	....
Wonokromo, East Java	700	....	....
Total	**341,300**	**11,500**	**22,820**
IRAN			
National Iranian Oil Co.–Esfahan	200,000	....	29,600
Shiraz	40,000	....	6,245
Tabriz	80,000	....	....
Tehran	210,000	....	28,000
Total	**530,000**	....	**63,845**

Note: Present status uncertain due to Iran-Iraq war.

IRAQ

Oil Refineries Administration–Basra	70,000	....	....
Daura	71,000	....	5,000
K3-Haditha	7,000	....	....
Khanaqin	12,000	....	....
Multhia	4,500	....	....
Qaiyarah, Mosul	2,000	....	....
Iraqi Company for Oil Operations–Kirkuk	2,000	....	....
Total	**168,500**	....	**5,000**

Note: Present status uncertain due to Iran-Iraq war.

IRELAND

Irish Refining CL–Whitegate	56,000	....	[2]14,500
Total	**56,000**	....	**14,500**

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
ISRAEL			
Oil Refineries Ltd.–Ashdod	70,000	....	[2]9,300
Haifa	120,000	[1]15,000	[2]15,000
Total	**190,000**	**15,000**	**24,300**
ITALY			
Amoco Italia SpA–Cremona	100,000	....	[2]10,200
ANIC SpA–Gela	80,000	[1]21,000	[2]14,000
Ragusa	7,000	....	....
Anonima Petroli Italiana–Falconara, Marittima	83,000	....	[2]11,000
Aquila SpA–Trieste	110,000	....	17,000
ERG SpA–Genca, San Quirico	130,000	....	[4]10,500
Esso Italiana SpA–Augusta, Siracusa	181,200	[1]40,100	15,100
Industrie Chimiche Italiane de Petrolio SpA–Frassino, Mantovano	55,000	....	9,500
Industria Italiana Petroli–La Spezia	80,800	....	[1]20,200
Rho[1]	79,800	[2]13,700	[2]16,000
Taranto	90,900	....	[2]16,000
Industria Leganti Stradali del Affini (Ilsea)–Como	10,140	....	1,700
Iplom SpA–Busalla	46,500	....	....
Irom–Industria Raffinazione Oli Minerali–Porto Marghera	108,000	....	[4]17,500
ISAB–Melilli	220,000	....	[2]24,000
Lombarda Petroli SpA–Villasanta	23,500	....	[5]4,000
Mediterranea SpA–Milazzo, Sicily	290,000	[1]40,000	[3]10,000
Mobil Oil Italiana SpA–Naples	100,000	[2]18,400	[2]12,500
Montedipe SpA–Priolo, Siracusa	300,000	[1]30,000	[1]10,000
Raffineria Delle Piane SpA–Genoa, San Quirico	3,000	2,700	....
Raffineria del Po SpA–Sannazaro de Burgondi	230,000	[1]27,000	[4]30,000
Raffineria di Roma SpA–Rome	91,200	....	[2]15,100
Sanquirico SpA–Genoa, San Quirico	32,500	....	1,500
Saras SpA–Sarroch	324,000	[1]57,000	[2]13,000
			[4]13,000
Sarom–Ravenna	150,000	....	[2]10,000
Sarpom–Trecate, Novara	215,000	[1]12,000	27,000
Soc. Petrolifera Italiana–Arcola, La Spezia	30,667	....	....
Stanic–Livorno	111,200	....	[2]19,500
Total	**3,283,407**	**259,200**	**348,300**

[1]Solvent extraction 3,110 b/d (propane for lube oil and cat cracker feed).

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
IVORY COAST			
Ste. Ivoirienne de Raffinage–Abidjan	80,000	....	[2]14,600
Ste. Multinationale de Bitumes–Abidjan	10,075	..	....
Total	**90,075**	....	**14,600**
JAMAICA			
Esso West Indies Ltd.–Kingston	35,500	....	[1]3,500
Total	**35,500**	....	**3,500**
JAPAN			
Asia Kyoseki CL–Sakaide, Kagawa	135,000	[1]13,500	[2]9,000
Asia Oil CL–Hakodate	22,500	....	[2]1,170
Yokohama, Kanagawa	90,000	....	[2]12,600
Chita Oil CL–Nagoya	100,000	....	[1]22,000
Daikyo Oil CL–Yokkaichi City	215,000	[1]23,500	[2]6,000
			[4]8,000
Fuji Kosan Oil CL–Kainan	77,600	....	....
Fuji Oil CL–Sodegaura	189,900	[1]10,800	[2]13,600
General Sekiyu Seisei KK–Kawasaki	55,000	....	[1]8,500
Sakai	120,000	....	[1]25,000
Idemitsu Kosan CL–Chita, Aichi	130,000	....	[4]18,000
Himeji, Hyogo	110,000	....	[2]15,000
Ichihara, Chiba	310,000	[1]39,000	[2]25,000
Tokuyama, Yamaguchi	140,000	[1]23,000	[2]12,000
Tomakomai, Hokkaido	70,000	....	[2]11,000
Kashima Oil CL–Kashima, Ibaragi	180,000	[1]14,000	[2]7,500
Koa Oil CL–Marifu	141,550	[1]12,600	[2]9,900
Osaka	76,000	[1]14,400	[3]8,100
Kyokuto Petroleum Ltd.–Chiba	143,000	....	[2]14,500
Kyushu Oil CL–Oita	170,000	[1]15,000	[1]8,000
Maruzen Oil CL–Chiba	230,000	[1]26,000	[2]25,000
Matsuyama	30,000	....	[2]5,000
Sakai	110,000	[1]19,500	[2]5,000
Shimotsu	22,500	[1]6,500	[2]5,500
Mitsubishi Oil CL–Kawasaki	94,500	....	[2]14,850
Mizushima	243,000	[1]20,700	[2]30,330
Nichimo Sekiyu Seisei KK–Kawasaki	80,000	....	[1]7,600
Nihonkai Oil CL–Toyama	60,000	....	....
Nippon Mining CL–Funakawa	14,150	....	....
Mizushima[1]	235,200	[1]30,000	[1]23,000
Nippon Oil CL–Niigata	28,000	....	[2]5,100
Nippon Petroleum Refining CL–Kudamatsu	42,000	....	[2]3,300
Muroran	110,000	[1]16,000	[2]18,000
Negishi	330,000	[1]32,000	[2]31,000
Yokohama	70,000	[1]5,600	[2]3,300
Seibu Sekiyu KK–Onoda	172,000	....	18,000
Showa Sekiyu KK–Kawasaki	135,000	....	20,000
Niigata	40,000	....	4,400
Showa Yokkaichi Sekiyu KK–Yokkaichi	276,000	16,000	31,000
Taiyo Oil CL–Ehime	69,000	....	[2]5,000
Toa Nenryo Kogyo–Kawasaki	200,000	[1]63,000	[1]16,000
Shimizu	43,500	....	[1]4,600
Wakayama	198,000	[1]29,300	[1]36,000
Toa Oil CL–Kawasaki	100,000	....	[2]11,000
Toho Oil CL–Owase	40,000	....	....
Tohoku Oil CL–Sendai	100,000	....	[2]13,000
Total	**5,548,400**	**430,400**	**570,850**

[1]Solvent extraction 4,300 b/cd.

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
JORDAN			
Jordan Petroleum Refinery–Zerka	100,000	[1]4,410	[2]8,640
Total	**100,000**	**4,410**	**8,640**
KENYA			
East African Oil Refineries Ltd.–Mombasa	**79,000**	....	[1]**8,500**
KOREA, N.			
Government-owned, Unggi	**42,000**		
KOREA, S.			
Honam Oil Refinery CL–Yosu	355,000	....	[2]15,300
Kukdong Oil CL–Busan	12,500	....	....
Kyung In Energy CL–Inchon	60,000	....	[2]3,600
Modern Petroleum CL–Busan	2,000	....	....
Ssangyong Oil Refining CL–Onsan[1]	60,000	....	....
Yukong Ltd.–Ulsan	265,000	....	[2]17,650
Total	**754,500**	....	**36,550**

[1]Solvent extraction 8,000 b/cd.

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
KUWAIT			
Arabian Oil CL–Ras Al Khafji	30,000	....	....
Getty Oil Co.–Mina Saud	50,000	....	....
Kuwait National Petroleum Co.–Mina Abdulla	106,000	....	....
Mina Al-Ahmadi	250,000	....	[2]33,120
Shuaiba	187,000	....	[2]14,000
Total	**623,000**	....	**47,120**
LEBANON			
Tripoli Oil Installations–Tripoli	35,000	[1]7,250	4,392
Mediterranean Refining Co.–Sidon	17,000	....	[1]2,900
Total	**52,000**	**7,250**	**7,292**
LIBERIA			
Liberia Petroleum Refining–Monrovia	15,000	....	[1]2,000
Total	**15,000**	....	**2,000**
LIBYA			
Azzawiya Oil Refining Co.–Azzawiya	120,000	....	[2]12,982
Esso Sirte–Marsa El Brega	9,500	....	[1]1,500
Total	**129,500**	....	**14,500**

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
MADAGASCAR			
Solima–Managareza, Tamatave	16,350	....	[4]2,600
MALAYSIA			
Esso Malaysia Berhad–Port Dickson	40,000	....	[1]6,300
Sarawak Shell Berhad–Luton	45,000	....	....
Shell Refining Co. Berhad–Port Dickson	90,000	....	4,000
Total	175,000	....	10,300
MARTINIQUE			
Ste. Anonyme de la Raffinerie des Antilles–Fort-de-France	11,000	....	[4]2,500
MEXICO			
Petroleos Mexicanos–Azcapotzalco	105,000	[1]24,000	....
Cadereyta	235,000	[1]40,000	[6]20,000
Madero	185,000	[1]51,000	[6]15,000
Minatitlan	199,000	[1]24,000	[6]54,000
		[2]21,000	
Poza Rica	26,000	....	....
Reynosa	9,000	....	....
Salamanca	200,000	[1]40,000	[6]24,800
		[2]18,000	
Salina Cruz	170,000	[1]40,000	[6]20,000
Tula, Hidalgo	160,000	[1]40,000	[6]30,000
Total	1,289,000	298,000	163,800
MOROCCO			
Samir–Mohammedia	50,000	....	6,500
Ste. Cherifienne des Petroles–Sidi Kacem	24,000	....	[3]2,123
Total	74,000	....	8,623
MOZAMBIQUE			
Government owned	16,000		
NETHERLANDS			
BP Raffinaderij Nederland NV–Rotterdam	437,000	[1]36,000	[2]25,000
Chevron Petroleum Mij. (Nederland) BV–Pernis	260,000	....	[2]38,000
Esso Nederland BV–Rotterdam	185,000	....	[1]20,700
			[3]28,000
Gulf Oil Raffinaderij BV–Europoort	75,500	...	[2]8,200
Shell Nederland Raffinaderij BV–Pernis	436,000	[1]75,000	54,000
Smid & Hollander BV–Amsterdam	8,000	....	....
Total Raffinaderij Nederland NV–Vlissingen	150,000	....	[2]14,000
Total	1,551,500	111,000	187,900
NETHERLANDS ANTILLES			
Lago Oil & Transport CL-Aruba	420,000	....	....
Shell Curacao NV-Curacao	362,000	42,000	15,000
Total	782,000	42,000	15,000
NEW ZEALAND			
New Zealand Refining-Whangarei	74,000	....	24,000
NICARAGUA			
Esso Standard SA Ltd.—Managua	14,400	....	[1]2,850
Total	14,400	....	2,850
NIGERIA			
Nigerian Petroleum Refining CL—			
Kaduna	100,000	[1]21,000	[1]17,500
Port Harcourt, Alesa Eleme	60,000	....	[1]6,000
Warri	100,000	[1]26,000	....
Total	260,000	47,000	23,500
NORWAY			
AS Norske Esso–Slagentangen	90,000	....	[2]9,000
Valloy	2,700	....	....
AS Norske Shell-Sola	60,000	....	10,000
Rafinor AS-Mongstad	90,000	....	[2]10,000
Total	242,700	....	29,000
OKINAWA			
Nansei Sekiyu KK—Nishihara	55,000	....	[1]9,600
Nippon Petroleum Refining CL—Nakagusuku	28,000	....	[2]2,000
Okinawa Sekiyu Seisei—Yonashiro	100,000	....	....
Total	183,000	....	11,600
OMAN			
Oman Refinery Co.—Mina Al Fahal	45,890	....	[2]9,178
Thai Oil Refinery CL–Sriracha, Cholburi	65,000	8,800	8,700
Total	176,000	8,800	25,100
TOGO			
Ste. Togolaise des Hydrocarbures—Lome	20,000	....	[4]4,400
TRINIDAD			
Texaco Trinidad Inc.—Pointe-a-Pierre	275,000	[1]25,000	[1]10,000
			[2]10,000
Trinidad and Tobago Oil CL—Point Fortin	100,000	....	[1]7,000
Total	375,000	25,000	27,000
TUNISIA			
Ste. Tunisienne Industries des Raffinage—Bizerte	34,000	....	3,300
TURKEY			
Anadolu Tasfiyehanesi AS—Mersin	90,000	....	[2]10,500
Istanbul Petrol Rafinerisi AS—Izmit	270,000	[1]25,000	[2]24,000
Turkish Petroleum Corp.—Aliaga	85,700	[1]12,660	[2]8,200
Batman	21,700	[3]3,600	[2]1,175
Total	467,400	41,260	43,875
UNITED KINGDOM			
England			
Conoco Ltd.—South Killingholme	130,000	....	[2]64,000
Esso Petroleum CL—Fawley	304,000	[1]80,750	[2]29,450
			[4]23,750
Lindsey Oil Refinery Ltd.—Killingholm, South Humberside	190,000	[1]35,000	[2]33,600
Mobil Oil CL—Coryton, Essex	145,000	[1]36,000	[2]27,000
Phillips Imperial Petroleum Ltd.—Port Clarence	100,000	....	....
Philmac Oils Ltd.—Eastham, Cheshire	12,000	....	....
Shell U.K. Ltd.—Shell Haven	175,000	....	45,000
Stanlow	250,000	49,000	38,000
Teesport	107,000	....	15,000
Total	1,413,000	200,750	275,800
Scotland			
BP Refinery Grangemouth Ltd.—Grangemouth	173,000	[1]17,000	[2]23,000
Shell U.K. Ltd.—Ardrossan	5,500	....	....
Total	178,500	17,000	23,000
Wales			
Amoco UK Ltd.—Milford Haven	102,000	[1]31,500	[2]17,500
BP Refinery Llandarcy Ltd.—Llandarcy, Neath	112,000	[1]18,000	[2]19,000
Esso Petroleum CL—Milford Haven, Dyfed	171,000	....	[2]21,850
Gulf Oil Refining Ltd.—Milford Haven	103,000	....	[2]22,000
Texaco Ltd.—Pembroke, Dyfed	180,000	....	[4]20,000
Total	668,000	49,500	100,350
Total United Kingdom	2,259,500	267,250	399,150
URUGUAY			
Administración Nacional de Combustibles, Alcohol y Portland–La Teja, Montevideo	45,000	[1]5,000	[1]3,000
Total	45,000	5,000	3,000

REFINING capacity around the world plunged during 1982.

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
U.S.S.R.			
Government-owned refineries at Angarsk, Baku, Batumi, Drogobych, Fergana, Gorki, Grozny, Guryev, Ishimbai, Khabarovsk, Kherson, Kirishi, Komosomolsk, Krasnovodsk, Kremenchug, Kuibyshev, Kuibyshev, Lisichansk, Mazheikiai, Moscow, Mozyr, Nadvornaya, Nizhnekamsk, Odessa, Orsk, Pavlodar, Perm, Polotsk, Ryazan, Saratov, Syzran, Tuapse, Ufa, Ukhta, Vannovskiy, Volgograd, and Yaroslavl.			
Total	**11,750,000**		
VENEZUELA			
Corpoven–Bajo Grande	61,000	....	....
El Palito	105,000	[1]42,000	[1]7,500
El Toreno	5,400	....	....
Lagoven–Amuay Bay	630,000	[1]66,900	....
Maraven–Punta Cardon	282,000	[1]57,000	....
Meneven–Puerto La Cruz	195,000	[1]12,000	....
San Roque	5,300	....	....
Total	**1,283,700**	**177,900**	**7,500**
VIRGIN ISLANDS			
Hess Oil Virgin Islands Corp.–St. Croix	600,000	....	[2]125,000
Total	**600,000**	**....**	**125,000**

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
YEMEN, S.			
Aden Refinery Co.–Little Aden[1]	178,000	....	[1]12,000
[1]Solvent extraction 8,150 b/cd.			
YUGOSLAVIA			
Bosanski Brod	43,129	....	[2]6,360
Lendava	13,500	....	....
Novi Sad	11,100	....	....
Pancevo	29,878	....	3,996
Rijeka	160,000	....	18,500
Sisak	38,800	[1]1,960	16,300
Zagreb	600	....	....
Total	**297,007**	**1,960**	**45,156**
ZAIRE			
Soc. Zairo-Italienne de Raffinage–Muanda	17,000	....	[2]3,500
ZAMBIA			
Indeni Petroleum Refinery CL–Bwana Nkubwa Area, Ndola	24,500	....	[4]5,600

UNITED STATES

Survey of operating refineries in the U.S. (state capacities as of January 1, 1983

State	No. plants	Crude capacity b/cd	Cat cracking Fresh feed	Cat reforming
Alabama	5	175,500	...	31,500
Alaska	4	135,500	...	10,000
Arizona	1	5,800	...	1,500
Arkansas	4	66,370	16,000	9,000
California	37	2,497,793	589,000	574,350
Colorado	3	83,500	23,000	19,500
Delaware	1	140,000	62,000	42,000
Georgia	2	24,000	...	...
Hawaii	2	104,490	22,000	13,000
Illinois	7	997,500	374,000	310,400
Indiana	5	466,500	177,000	111,200
Kansas	7	343,527	139,400	105,200
Kentucky	3	239,200	70,000	49,000
Louisiana	21	2,197,958	768,400	481,280
Maryland	1	14,200	...	...
Michigan	4	118,000	45,000	33,000
Minnesota	2	198,550	76,000	46,000
Mississippi	6	364,100	74,000	95,800
Montana	6	150,450	50,600	41,000
Nevada	1	4,500	...	...
New Jersey	5	502,700	227,000	100,500
New Mexico	6	118,828	30,100	23,750
North Dakota	2	60,800	26,000	12,000
Ohio	5	514,300	185,700	159,700
Oklahoma	10	473,800	169,300	120,400
Oregon	1	15,000	...	...
Pennsylvania	9	718,550	255,300	209,900
Tennessee	1	49,000	30,000	9,300
Texas	40	4,532,005	1,567,600	1,079,500
Utah	7	161,775	54,800	26,700
Virginia	1	53,000	28,000	9,500
Washington	7	407,700	91,500	110,000
West Virginia	2	16,500	...	4,400
Wisconsin	1	40,000	9,700	10,000
Wyoming	6	165,765	69,000	31,250
	225	16,157,161	5,230,400	3,880,630

U.S. refineries:

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
ALABAMA			
Hunt Oil Co.—Tuscaloosa	44,220	.....	[2]6,000
Louisiana Land & Exploration Co.—Saraland	80,000	.....	[2]21,000
Marion Corp.—Theodore	25,300	.....	[2]4,500
Mobile Bay Refining Co.—Chickasaw	20,000	.....	.....
Warrior Asphalt of Alabama—Holt	NR	.....	.....
Total	**175,500**	.....	**31,500**
ALASKA			
Atlantic Richfield Corp.—Prudhoe Bay	20,000	.....	.....
Chevron U.S.A. Inc.—Kenai	22,000	.....	.....
North Pole Refining, Division of Mapco—North Pole	45,000	.....	.....
Tesoro Petroleum Corp.—Kenai	48,500	.....	.....
Total	**135,500**	.....	**10,000**
ARIZONA			
Arizona Fuels Corp.—Fredonia	**5,800**	.....	[1]**1,500**
ARKANSAS			
Berry Petroleum, Division of Crystal Oil Co.—Stevens	4,000	.....	.....
Cross Oil & Refining Co. of Arkansas—Smackover	9,800	.....	.....
Macmillan Ring-Free Oil Co.—Norphlet	5,870	.....	.....
Tosco Corp.—El Dorado	46,700	[1]16,000	[1]9,000
Total	**63,370**	**16,000**	**9,000**
CALIFORNIA			
Anchor Refining Cl—McKittrick	10,000	.....	.....
Atlantic Richfield Co.—Carson	205,000	[1]58,000	[2]38,000
Beacon Oil Co.— 17,880	.....	[2]3,650	
Champlin Petroleum Co.—Wilmington	60,000	[1]30,000	[6]12,000
Chevron U.S.A. Inc.—Bakersfield	26,000	.....	[2]6,000
El Segundo	405,000	[1]63,000	[2]60,000
Richmond	365,000	[1]63,000	[2]84,000
Douglas Oil Co.-Santa Maria	9,500	.....	.....
Eco Petroleum Inc.—Signal Hill	7,000	.....	.....
Edgington Oil Cl—Long Beach	41,600	.....	.....
Exxon Co.—Benicia	106,000	[1]50,000	[3]26,000
Fletcher Oil & Refining Co.—Carson	29,500	[1]10,000	[2]4,200
Getty Refining & Marketing Co.—Bakersfield	60,000	.....	[2]9,200
Golden Bear Division, Witco Chemical Corp.—Oildale	10,818	.....	.....
Golden Eagle Refining Co.—Carson	16,500	.....	.....
Gulf Oil Refining & Marketing Co.—Santa Fe Springs	51,500	[1]13,500	[2]19,000
Huntway Refining Co.—Benicia	NR	.....	.....
Wilmington	5,425	.....	.....
Independent Valley Energy Co.—Bakersfield	NR	.....	.....
Kern County Refinery Inc.—Bakersfield	21,400	.....	[2]3,000
Marlex Oil & Refining Inc.—Long Beach	NR	.....	.....
Mobil Oil Corp.—Torrance	123,500	[1]61,000	[2]36,000
Newhall Refining Cl—Newhall	21,400	.....	[1]2,300
Oxnard Refinery—Oxnard	4,700	.....	.....
Pacific Oasis—Paramount	46,500	.....	[2]11,500
Pacific Refining Co.—Hercules	45,000	.....	[2]15,000
Powerine Oil Co.—Santa Fe Springs	44,120	[1]13,500	[2]8,000
Sabre Refining Inc.—Bakersfield	10,000	.....	.....
Shell Oil Co.—Martinez	91,400	[1]60,000	[3]25,000
Wilmington	108,000	[1]35,000	[2]24,000
Sunland Refining Corp.—Bakersfield	15,000	.....	[2]1,500
Texaco Inc.—Wilmington	75,000	[1]28,000	[2]35,000

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
Tosco Corp.—Bakersfield	NR	[2]12,000	[2]16,500
Martinez	126,000	[1]47,000	[1]8,700
			[2]21,300
			[6]20,000
Union Oil Co. of California—			
Los Angeles	108,000	[1]45,000	[2]49,000
Rodeo	111,000	.....	[2]28,000
USA Petrochem Corp.—Ventura	27,900	.....	[2]7,500
Total	**2,497,793**	**589,000**	**574,350**

[1]Solvent extraction: 50,000 b/sd.

COLORADO

Asamera Oil U.S. Inc.—			
Commerce City	NR	[1]8,000	[2]10,000
Conoco Inc.—Commerce City	32,500	[1]15,000	[2]7,000
Gary Refining Co.—Fruita	13,000	.....	[2]2,500
Total	**83,500**	**23,000**	**19,500**

DELAWARE

Getty Refining and Marketing Co.—			
Delaware City	140,000	[1]62,000	[2]42,000
Total	**140,000**	**62,000**	**42,000**

GEORGIA

Amoco Oil Co.—Savannah	24,000	.....	.....
Young Refining Corp.—Douglasville†	.....	.....	.....
Total	**24,000**	.....	.....

†Topping: 5,000 b/sd.

HAWAII

Chevron U.S.A. Inc.—Barber's Point	48,000	[1]22,000	.....
Hawaiian Independent Refinery Inc.—Ewa Beach	56,490	.....	[2]13,000
Total	**104,490**	**22,000**	**13,000**

ILLINOIS

Clark Oil & Refining Corp.—			
Blue Island	57,000	[1]25,000	[2]30,500
Hartford	47,500	[1]27,000	[2]12,000
Marathon Oil Co.—Robinson	195,000	[1]38,000	[1]12,400
			[4]35,000
			[6]30,000
Mobil Oil Corp.—Joliet	180,000	[1]98,000	[2]46,000
Shell Oil Co.—Wood River	283,000	[1]94,000	[2]22,000
			[3]68,000
Texaco Inc.—Lawrenceville	84,000	[1]34,000	[2]24,000
Union Oil Co. of California—Lemont	151,000	[1]58,000	[2]30,500
Total	**997,500**	**374,000**	**318,400**

INDIANA

Amoco Oil Co.—Whiting	376,000	[1]150,000	[3]99,000
Gladieux Refinery Inc.—Ft. Wayne	18,600	.....	.....
Indiana Farm Bureau Cooperative Association Inc.—Mt. Vernon	20,600	[1]8,000	[2]3,500
Laketon Refining Corp.—			
Laketon	8,100	.....	.....
Rock Island Refining Corp.—			
Indianapolis[1]	43,200	[1]19,000	[4]8,700
Total	**466,500**	**177,000**	**111,200**

Solvent refining: [1]4,500.

KANSAS

Derby Refining Co.—Wichita	28,800	[2]10,800	[2]7,000
Farmland Industries Inc.—Coffeyville	56,500	[1]23,000	[2]16,000

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
Getty Refining & Marketing Co.—			
El Dorado	80,577	[1]31,000	[2]25,000
Mobil Oil Corp.—Augusta	50,000	[2]22,100	[1]10,400
			[4]12,500
National Cooperative Refinery Association—McPherson	54,150	[1]20,000	[2]13,000
Pester Refining Co.—El Dorado[1]	31,000	[1]14,500	[2]5,000
Total Petroleum—Arkansas City	42,500	[1]18,000	[1]16,300
Total	**343,527**	**139,400**	**105,200**

[1]Solvent extraction 5,200 b/sd.

KENTUCKY

Ashland Petroleum Co.—Catlettsburg[1]	NR	[1]60,000	[2]18,000
			[6]27,000
Louisville	NR	[1]10,000	[2]3,000
Somerset Refinery Inc.—Somerset	5,500	.....	[2]1,000
Total	**239,200**	**70,000**	**49,000**

[1]Solvent extraction: 10,000 b/sd.

LOUISIANA

Atlas Processing Co., Division of Pennzoil—Shreveport[1]	76,500	.....	[1]5,000
			[2]10,000
Calumet Refining Co.—Princeton	NR	.....	.....
Canal Refining Co.—Church Point	7,858	.....	[1]1,600
Celeron Oil & Gas Cl—Mermentau	14,000	.....	.....
Cities Service Co.—Lake Charles	320,000	[1]150,000	[2]46,000
			[4]45,000
Claiborne Gasoline Co.—Lisbon	6,500	.....	[1]2,200
Conoco Inc.—Lake Charles	156,500	[1]30,600	[2]21,000
Cotton Valley Solvents (Kerr-McGee Refining Corp.)—Cotton Valley	5,000	.....	.....
CPI Refining Inc.—Lake Charles	NR	.....	.....
Exxon Co.—Baton Rouge[2]	455,000	[1]155,000	[2]95,000
Gulf Oil Refining & Marketing Co.— Belle Chasse	199,100	[1]89,000	[2]40,000
Hill Petroleum Co.—Krotz Springs	48,000	[1]22,500	[2]12,000
Kerr McGee Corp.—Dubach	7,800	.....	[1]3,480
Mallard Resources Inc.—Gueydon	6,000	.....	.....
Marathon Oil Co.—Garyville	255,000	[1]75,000	[6]50,000
Murphy Oil Corp.—Meraux	92,500	[1]35,300	[6]23,000
Placid Refining Co.—Port Allen	50,000	[1]18,500	[2]7,000
Port Petroleum Inc.—Stonewall	3,200	.....	.....
Shell Oil Co.—Norco	218,200	[1]100,000	[2]18,000
			[3]28,000
Tenneco Oil Co.—Chalmette	114,000	[1]22,500	[2]28,000
			[5]16,000
Texaco Inc.—Convent	140,000	[1]70,000	[2]30,000
Total	**2,197,958**	**768,400**	**481,280**

Solvent extraction: [1]7,100 b/sd. [2]6,900 b/sd.

MARYLAND

Chevron U.S.A. Inc.—Baltimore	14,200	.....	.....

MICHIGAN

Crystal Refining Co.—Carson City	4,000	.....	.....
Lakeside Refining Co.—Kalamazoo	5,600	.....	[1]2,000
Marathon Oil Co.—Detroit	68,500	[1]27,000	[2]17,000
Total Petroleum Inc.—Alma	NR	[1]18,000	[1]14,000
Total	**118,000**	**45,000**	**33,000**

MINNESTOA

Ashland Petroleum Co.—St. Paul Park	NR	[1]23,000	[2]13,000
Koch Refining Co.—Rosemount	133,000	[1]53,000	[3]13,000
			[5]20,000
Total	**198,550**	**76,000**	**46,000**

MISSISSIPPI

Amerada-Hess Corp—Purvis	30,000	[2]18,000	[2]5,800

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
Chevron U.S.A. Inc.—Pascagoula	280,000	[1]56,000	[2]90,000
Ergon Refining Inc.—Vicksburg	20,600	.....	.....
Natchez Refining Inc.—Natchez	16,700	.....	.....
Southland Oil Co.—Lumberton	5,800	.....	.....
Sandersville	11,000	.....	.....
Total	**384,100**	**74,000**	**95,800**

MONTANA

Cenex—Laurel[1]	40,400	[1]12,000	[2]12,000
Conoco Inc.—Billings	48,500	[1]15,000	[2]15,800
Exxon Co.—Billings	45,000	[1]21,000	[1]10,000
Flying J Inc.—Cut Bank	5,600	.....	[2]2,200
Kenco Refining Inc.—Wolf Point	4,950	.....	.....
Simmons Refining Corp.—Great Falls	6,000	[1]2,100	[2]1,000
Total	**150,450**	**50,600**	**41,000**

[1]Solvent extraction: 4,000 b/sd.

NEVADA

Nevada Refining Co.—Tonopah	**4,500**	.....	.....

NEW JERSEY

Chevron U.S.A. Inc.—Perth Amboy	168,000	[3]33,000	[2]39,000
Exxon Co.—Linden	100,000	[1]120,000	[4]25,000
Mobil Oil Corp.—Paulsboro	99,700	[1]34,000	[2]23,500
Seaview Petroleum Inc.—Thorofare	45,000	.....	.....
Texaco Inc.—Westville	90,000	[1]40,000	[2]13,000
Total	**502,700**	**227,000**	**100,500**

NEW MEXICO

Giant Industries Inc.—Ciniza	18,000	[1]7,200	[2]6,800
Farmington	13,500	.....	[3]5,000
Navajo Refining Co.—Artesia	NR	[1]17,500	[1]1,700
			[2]6,000
Plateau Inc.—Bloomfield	NR	[1]5,400	[6]2,250
Southern Union Refining Co.—Lovington	NR	.....	.....
Thriftway Co.—Bloomfield	7,500	.....	[2]2,000
Total	**118,828**	**30,100**	**23,750**

NORTH DAKOTA

Amoco Oil Co.—Mandan	56,000	[1]26,000	[4]10,000
Flying J Inc.—Williston	4,800	.....	[2]2,000
Total	**60,800**	**26,000**	**12,000**

OHIO

Ashland Petroleum Co.—Canton	NR	[1]25,000	[6]20,000
Gulf Oil Refining & Marketing Co.—Cincinnati	43,700	[1]18,000	[2]11,000
Standard Oil Co. of Ohio—Lima	168,000	[1]37,700	[3]47,000
Toledo	120,000	[1]55,000	[3]40,700
Sun Cl-Toledo[1]	118,000	[1]50,000	[2]41,000
Total	**514,300**	**185,700**	**159,700**

[1]Solvent extraction: 11,000 b/sd.

OKLAHOMA

Allied Material Corp.—Stroud	7,900	.....	.....
Champlin Petroleum Co.—Enid	53,800	[1]19,500	[2]15,000
Conoco Inc.—Ponca City	134,000	[1]45,000	[2]33,500
Kerr-McGee Refining Corp.—Wynnewood[1]	43,000	[1]20,000	[2]8,500
Oklahoma Refining Co.—Cyril	15,300	[1]7,800	[2]7,000
Custer County	12,300	.....	.....
Sun Cl—Tulsa	85,000	[1]30,000	[2]23,000
Tonkawa Refining Co.—Arnett	12,500	.....	[2]1,450
			[4]1,1450
Tosco—Duncan	48,000	[1]25,000	[2]8,000
Total Petroleum Corp.—Ardmore	62,000	[1]22,000	[1]22,500
Total	**473,800**	**169,300**	**120,400**

Solvent extraction: [1]5,000 b/sd. [2]5,900 b/sd.

OREGON

Chevron U.S.A. Inc.—Portland	**15,000**	.....	.....

PENNSYLVANIA

Atlantic Richfield Co.—Philadelphia	125,000	[1]29,000	[2]60,000
BP Oil Corp.—Marcus Hook	168,000	[1]48,000	[6]50,000
Gulf Oil Refining & Marketing Co.—Philadelphia[1]	174,100	[1]85,300	[2]32,000
Kendall-Amalie Division, Witco Chemical Co.—Bradford	7,600	.....	[2]2,000
Pennzoil Co.—Rouseville	15,700	.....	[2]3,600
Quaker State Oil Refining Corp.—Farmers Valley	6,500	.....	[2]2,000
Sun Cl—Marcus Hook	155,000	[1]75,000	[1]13,100
			[2]31,200
United Refining Co.—Western	60,000	[1]18,000	[2]16,000
Valvoline Oil Co., Division of Ashland Oil Co.—Freedom	NR	.....	.....
Total	**718,550**	**255,300**	**209,900**

Solvent extraction: [1]15,600 b/sd.

TENNESSEE

Delta Refining Co.—Memphis	49,000	[1]30,000	[2]9,300
Total	**49,000**	**30,000**	**9,300**

TEXAS

Amber Refining Co.—Fort Worth	20,000	[1]5,000	[1]1,700
			[2]3,800
American Petrofina Inc.—Big Spring[1]	NR	[1]23,500	[6]20,000
Port Arthur	90,000	[1]34,000	[1]20,000
Amoco Oil Co.—Texas City	415,000	[1]194,000	[4]152,000
Atlantic Richfield Co.—Houston	232,000	[1]78,000	[2]68,000
Champlin Petroleum Co.—Corpus Christi	173,000	[1]69,000	[6]25,000
Charter International Oil Co.—Houston[2]	NR	[1]50,000	[2]13,500
Chevron U.S.A. Inc.—El Paso	76,000	[1]22,000	[2]25,000
Coastal States Petroleum Co.—Corpus Christi	95,000	[1]19,500	[6]20,000
Crown Central Petroleum Corp.—Houston	100,000	[1]56,000	[2]14,000
			[5]22,000
Diamond Shamrock Corp.—Sunray[3]	71,100	[1]45,000	[2]16,000
Dorchester Refining Co.—Mt. Pleasant	24,000	[2]9,600	[2]3,500
Eddy Refining Co.—Houston	3,500	.....	[2]1,500
Exxon Co. U.S.A.—Baytown[4]	494,000	[1]155,000	[3]60,000
			[4]63,000
Flint Chemical Co.—San Antonio	1,200	.....	.....
Gulf Oil Refining & Marketing Co.—Port Arthur	412,700	[1]110,000	[2]40,500
			[4]40,000
Howell Hydrocarbons Inc.—San Antonio	9,780	.....	[1]800
Koch Refining Co.—Corpus Christi	105,000	[1]27,000	[1]11,000
			[3]13,000
LaGloria Oil & Gas Co.—Tyler	65,000	[1]17,000	[2]7,000
			[6]11,700
Liquid Energy Corp.—Bridgeport	10,000	.....	.....
Marathon Oil Co.—Texas City	69,500	[1]38,000	[1]8,000
Mobil Oil Corp.—Beaumont	325,000	[1]100,500	[2]102,000
Phillips Petroleum Co.—Borger	95,000	[1]60,000	[1]7,000
			[2]19,000
Sweeney	175,000	[1]87,000	[2]36,000
Pride Refining Inc.—Abilene	NR	.....	.....
Quintana Petrochemical Co.—Corpus Christi	NR	.....	[2]18,000
Saber Energy Inc.—Corpus Christi	NR	.....	.....

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
Shell Oil Co.—Deer Park	285,000	[1]65,000	[2]15,000 [3]40,000
Odessa	30,600	[1]10,500	[1]11,000
Sigmor Refining Co.—Three Rivers	47,000	[1]17,000	[2]8,000
South Hampton Refining Co.—Silsbee	16,500	.....	[2]4,000
Southwestern Refining Cl-Corpus Christi	104,000	[1]47,000	[2]30,000
Tesoro Petroleum Corp.—Carrizo Springs	26,100	.....	[2]3,000
Texaco Inc.—Amarillo	20,000	[1]8,000	[2]5,000
El Paso	17,000	[1]7,000	[2]3,500
Port Arthur[5]	402,000	[1]135,000	[2]60,000
Port Neches	31,000	.....	.....
Texas City Refining Inc.—Texas City	119,600	[1]40,000	[2]11,000
Uni Refining Inc.—Ingleside	41,000	.....	.....
Union Oil Co. of California—(Beaumont), Nederland	120,000	38,000	[3]34,000
Total	**4,532,005**	**1,567,600**	**1,079,500**

Solvent extraction: [1]1,000 b/sd. [2]10,000. [3]11,000 b/sd. [4]45,000 b/sd. [5]12,000 b/sd.

UTAH

Amoco Oil Co.—Salt Lake City	39,000	[1]18,000	[4]6,000
Caribou Four Corners Inc.—Woods Cross	8,200	.....	[2]2,500
Chevron U.S.A.—Salt Lake City	45,000	[1]11,000 [3]7,000	[2]5,500
Crysen Refining Co.—Woods Cross	12,500	.....	[2]3,000
Husky Oil Co.—North Salt Lake City	25,000	[2]4,400	[2]5,000
Phillips Petroleum Co.—Woods Cross[1]	24,000	[2]8,400	[2]4,700
Plateau Inc.—Roosevelt	NR	[1]6,000	.....
Total	**161,775**	**54,800**	**26,700**

[1]Solvent extraction: 5,000 b/sd.

VIRGINIA

Amoco Oil Co.—Yorktown	53,000	[1]28,000	[4]9,500
Total	**53,000**	**28,000**	**9,500**

WASHINGTON

Atlantic Richfield Co.—Ferndale	126,000	.....	[2]43,000
Chevron U.S.A. Inc.—Seattle	5,500	.....	.....
Mobil Oil Corp.—Ferndale	71,500	[2]25,500	[2]9,500 [4]11,500
Shell Oil Co.—Anacortes	91,000	[1]36,000	[3]20,000
Sound Refining Inc.—Tacoma	11,700	.....	.....
Texaco Inc.—Anacortes[1]	78,000	[1]30,000	[2]20,000
U.S. Oil & Refining Co.—Tacoma	24,000	.....	[2]6,000
Total	**407,700**	**91,500**	**110,000**

[1]Solvent extraction: 7,400 b/sd.

WEST VIRGINIA

Quaker State Oil Refiing Corp.—Newell	11,700	.....	[2]3,200
St. Mary's	4,800	.....	[2]1,200
Total	**16,500**	.....	**4,400**

WISCONSIN

Murphy Oil Corp.—Superior	**40,000**	[1]9,700	[2]10,000

WYOMING

Amoco Oil Co.—Casper	48,000	[1]13,000	[4]5,900
Husky Oil Co.—Cheyenne	28,800	[1]12,000	[1]1,000 [2]5,500
Little America Refining Co.—Casper	24,500	[1]12,500 [2]6,500	[2]6,100
Mountaineer Refining Cl—LaBarge	NR	.....	.....
Sinclair Oil Corp.—Sinclair	NR	[1]21,000	[1]10,000
Wyoming Refining Co.—Newcastle	12,500	[2]4,000	[1]2,750
Total	**165,765**	**69,000**	**31,250**

Survey of Canadian operating refineries (capacities as of January 1, 1983

State	No. plants	Crude capacity b/cd	Cat cracking Fresh feed	Cat reforming
Alberta	6	331,500	55,000	44,200
British Columbia	7	171,950	54,600	39,400
Manitoba	1	30,000	7,800	8,200
New Brunswick	1	237,500	19,000	38,500
Newfoundland	1	13,000	....	1,300
Northwest Territories	1	2,900	....	1,300
Nova Scotia	2	104,000	31,200	12,600
Ontario	7	580,700	156,500	149,150
Quebec	6	530,000	109,000	104,500
Saskatchewan	2	53,300	14,000	10,000
Total	34	2,054,850	447,100	407,850

Canada refineries:

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
ALBERTA			
Gulf Canada Products Co.—Calgary	12,900	.....	.....
Edmonton	98,100	.....	[4]14,500
Husky Oil Operations Ltd.—Lloydminister	23,500	.....	.....
Imperial Oil Ltd.—Edmonton	164,000	[1]46,000	[4]22,000
Shell Canada Ltd.—Bowden	5,000	.....	[6]2,700
Texaco Canada Inc.—Edmonton	28,000	[1]9,000	[1]5,000
Total	**331,500**	**55,000**	**44,200**
BRITISH COLUMBIA			
Chevron Canada Ltd.—North Burnaby	35,000	[1]10,500	[2]11,700
Gulf Canada Products Co.—Kamloops	9,500	[1]3,000	[4]1,900
Port Moody	37,200	[1]12,000	[4]10,500
Husky Oil Operations Ltd.—Prince George	9,400	[1]3,000	[1]1,400
Imperial Oil Ltd.—Ioco	40,900	[1]13,200	[1]6,900
Petro-Canada Exploration Inc.—Taylor	15,950	[1]6,600	[1]3,000
Shell Canada Ltd.—Shellburn	24,000	[1]6,300	[6]4,000
Total	**171,950**	**54,500**	**39,400**
MANITOBA			
Shell Canada Ltd.—St. Bonifcae	30,000	[1]7,800	[6]8,200
Total	**30,000**	**7,800**	**8,200**
NEW BRUNSWICK			
Irving Oil Ltd.—St. John	NR	[illegible]000	[2]38,500
Total	**237,500**	**19,000**	**38,500**
NEWFOUNDLAND			
Ultramar Canada Inc.—Holyrood	13,000	.....	[2]1,300
Total	**13,000**	.....	**1,300**

BIG new refinery complex for Canada's southern Alberta province was started up in midyear '82.

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
NORTHWEST TERRITORIES			
Imperial Oil Ltd.—Norman Wells	2,900	.....	.....
NOVA SCOTIA			
Imperial Oil Ltd.—Dartmouth	84,000	[1]24,000	[4]9,000
Texaco Canada Ltd.—Halifax	20,000	[1]7,200	[2]3,600
Total	**104,000**	**31,200**	**12,600**
ONTARIO			
BP Canada Inc.—Oakville	80,000	[1]24,000	[1]5,250
			[2]12,000
Gulf Canada Products Co.—Clarkson[1]	76,600	[1]19,500	[2]18,000
Imperial Oil Ltd.—Sarnia	124,100	[1]26,000	[2]17,000
			[4]14,000
Shell Canada Ltd.—Oakville	44,000	[1]4,000	[6]7,000
Sarnia	71,000	[1]16,000	[6]23,900
Sun Cl—Sarnia	90,000	[3]17,000	[1]5,500
			[2]22,500
Texaco Canada Ltd.—Nanticoke	95,000	[1]40,000	[2]24,000
Total	**580,700**	**156,500**	**149,150**

Solvent extraction: [1]5,000 b/sd.

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
QUEBEC			
BP Canada Inc.—Montreal	71,000	[1]20,000	[2]12,000
Gulf Canada Products Co.—Montreal[1]	66,000	[1]22,000	[4]9,000
Imperial Oil Ltd.—Montreal	83,000	[1]23,000	[4]11,500
Petro-Canada—Pointe-Aux-Trembles	90,000	[3]20,000	[2]32,000
Shell Canada Ltd.—Montreal	120,000	[1]24,000	[6]25,000
Ultramar Canada Inc.—St. Romuald	100,000	.....	[2]15,000
Total	**530,000**	**109,000**	**104,500**

Solvent extraction [1]3,500.

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
SASKATCHEWAN			
Consumer's Cooperative Refineries Ltd.—Regina	40,000	[1]14,000	[1]10,000
Gulf Canada Products Co.—Moose Jaw	13,300	.....	.....
Total	**53,300**	**14,000**	**10,000**

capacity comes on stream in the Middle East and Canada.

The swing in petrochemical production forecast for the remainder of the 1980s is from developed to developing hydrocarbon rich countries. This is evident in data taken from Oil & Gas Journal's late 1981 construction survey. The Asia/Pacific area's share of over 600 projects is 29%, that for the Middle East and Africa over 15%.

Western Europe's share, only about 11.5%, reflects the serious overcapacity situation that exists there. Projects now scheduled will provide enough petrochemical capacity there to carry the industry to 1990.

Scrap or convert. Petrochemical producers are struggling to regain or improve profitability through feedstock flexibility and better process efficiency. In Europe, Japan, and even in the U.S., the value of a scrap and build policy is being seriously considered. Older, less efficient plants are being shut down for revamping in some cases. Shell has announced the shutdown of a more than 10 year old ethylene plant at Deer Park, Tex., for modernization to improve energy and feedstock efficiency.

Revamp of a 15 year old plant at Feyzin, France, for Elf France by SFT-Lummus, has cut fuel needs, equivalent to 900-1,100 b/d. The project was expected to pay out in 18 months.

Many olefin producers are giving light feed flexibility to plants that were originally designed only for heavier feedstocks such as naphtha or gas oil.

Union Carbide added feedstock flexibility at Ponce, Puerto Rico, to equip its olefins unit there to use either LPG or naphtha.

Exxon has converted part of its Gulf Coast capacity to be able to use natural gas liquids as a portion of the feedstock. Dow has found that only minor modifications were necessary at its Plaquemine, La., complex to permit it to use lighter liquids than the naphtha for which it was originally designed. Looming in the future is the shadow of export oriented plants in Canada and the Middle East based on low cost feedstocks.

Saudi Arabia in particular has a multibillion dollar petrochemical plan now being implemented that the Saudis expect will lead to the capture of 4-5% of the worldwide petrochemical market in the late 1980s. The Saudis hope to prevent serious market disruption by establishing partnerships with major companies in the field who will then expect to rationalize production elsewhere to make way for Saudi exports.

In Japan, basic raw material and resin producers already are rationalizing production. Polyvinyl chloride suppliers are integrated into four groups, each with a single sales department. The groups will cooperate to control production, stabilize the domestic market, and become more competitive in world markets. Ethylene producers also have received government approval to form a recession cartel aimed at rationalizing capacity and controlling production.

European spokesmen have indicated that such a rationalization of production would be a good idea for them. But it would have to be done at arms length to conform to the EEC ground rules.

Hopeful future. Overall, the petrochemical industry's outlook is still cloudy. But the majority of producers look to a brigher future. Even modest economic growth would led to a brisk upturn in the last half of 1983.

Reduced new plant construction coupled with significant rationalization of existing capcity should bring supply and demand more into balance.

Hopefully, the industry is now fully aware of the maturing nature of its markets and will avoid another building boom that could lead to a repeat of the current overcapacity, low profit scenario. There is no doubt that the petrochemical world will continue to internationalize.

Table 1

Petrochemical construction worldwide

	1975	1978	1981
NORTH AMERICA			
Canada	38	11	34
United States	125	92	60
Total	**163**	**103**	**94**
LATIN AMERICA			
Argentina	32	30	18
Bolivia	9	11	15
Brazil	47	36	36
Chile	9	7	—
Colombia	5	3	5
Ecuador	—	1	3
Mexico	17	24	84
Peru	6	—	1
Puerto Rico	12	—	—
Trinidad	1	—	2
Venezuela	1	—	—
Total	**152**	**125**	**85**
ASIA/PACIFIC			
Australia	13	5	7
Burma	—	—	1
China (mainland)	45	21	31
Hong Kong	1	—	—
India	61	29	40
Indonesia	23	9	5
Japan	74	32	35
Korea	19	23	13
Malaysia	1	—	—
New Zealand	—	—	3
Pakistan	10	11	3
Philippines	—	1	2
Singapore	2	1	5
Sri Lanka	2	2	—
Taiwan	43	13	28
Thailand	—	1	3
Total	**294**	**148**	**176**
WESTERN EUROPE			
Austria	9	3	7
Belgium	27	6	3
Denmark	—	—	—
Finland	4	1	—
France	40	10	3
Germany (West)	35	10	9
Ireland	4	2	--
Italy	39	31	1
Netherlands	13	10	7
Norway	3	1	—
Portugal	14	13	11
Spain	57	30	21
Sweden	2	2	1
U.K.	16	14	7
Total	**135**	**133**	**94**
MIDDLE EAST AND AFRICA			
Algeria	7	1	†
Egypt	20	6	3
Iran	2	18	na§
Iraq	12	10	na
Israel	6	5	3
Jordan	—	—	4
Kuwait	6	9	8
Libya	4	6	8
Madagascar	—	—	2
Nigeria	—	—	2
Qatar	2	4	†
Rep. of S. Africa	12	1	11
Saudi Arabia	2	16	19
Sudan	2	1	†
Tanzania	—	—	2
Turkey	17	19	23
Others	—	12	†8
Total	**92**	**108**	**93**
World total	**1099**	**750**	**612**

* For projects, all units are counted separately—either proposed, planned, or under way at a given location. Some projects involve several units.
† Countries with one project each: Abu Dhabi, Algeria, Bahrain, Kenya, Qatar, Sengal, Somalia, Sudan.
§ Not available.

Design challenge for the 80s: flexibility and optimum efficiency

SOARING ENERGY AND feedstock costs offer new challenges to process designers. The new ball game calls for changes in both design philosophy and technique. The future process designer will have to broaden his base in both design philosophy and technology to provide flexible, efficient designs with which operators can achieve the desired maximum feedstock utilization and minimum energy requirement.

Process design history comprises

Table 2

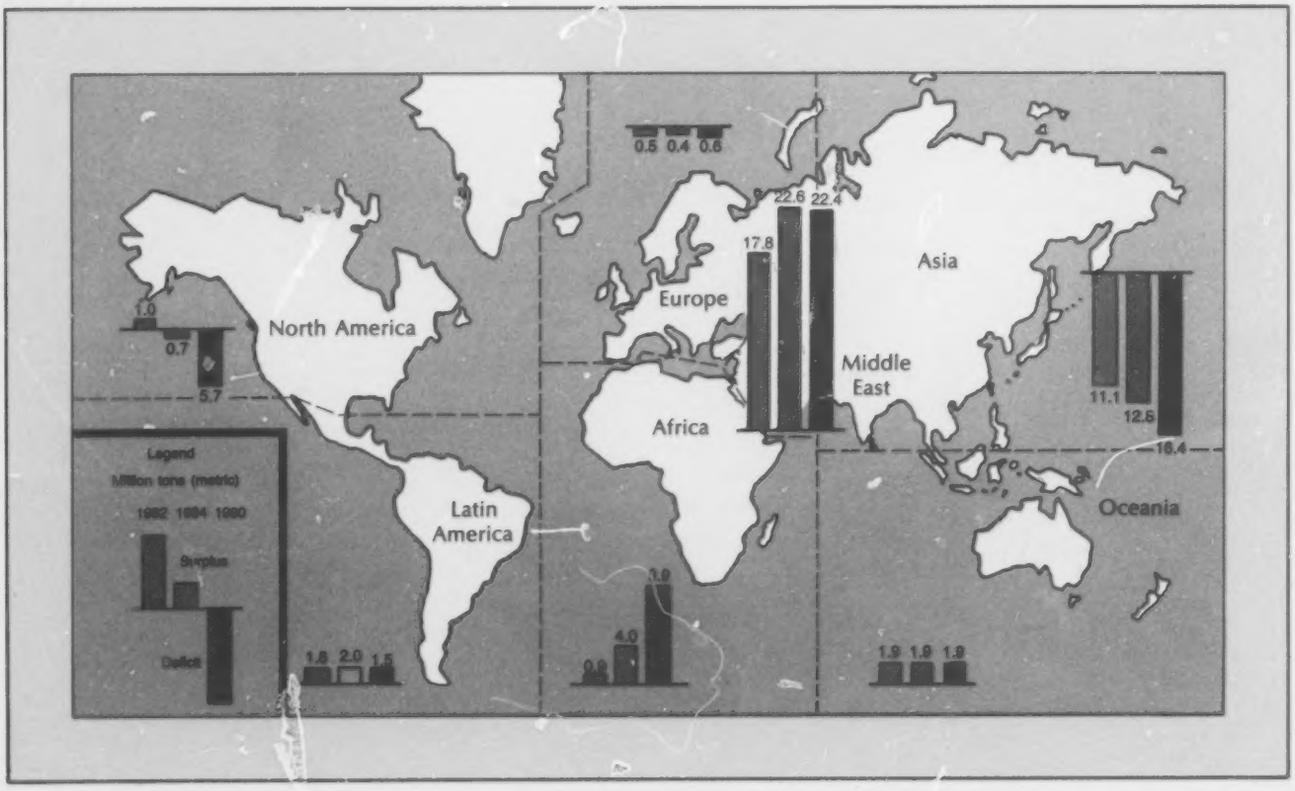
How ethylene capacity has changed*

Area	10,000 metric tons/year 1980	1981	1982
NORTH AMERICA			
U.S.	16,791.5	18,064.96	17,836
Canada	1,792.5	1,791	1,791
Total	18,584.01	19,855.96	19,627
LATIN AMERICA			
Argentina	173	173	253
Bolovia	230	230	230
Brazil	802	1,222	1,242
Chile	60	60	60
Colombia	16	115	215
Mexico	435	435	835
Puerto Rico	759.5	759.5	413
Venezuela	150	150	150
Total	2,625.5	3,144.5	3,498
WESTERN EUROPE			
Austria	260	260	265
Belgium	520	520	520
Finland	165	165	165
France	2,645	2,905	2,845
West Germany	4,755	4,965	4,105
Greece	15	15	15
Italy	1,675	2,250	2,070
Netherlands	†2,725	†2,725	2,260
Norway	300	300	300
Portugal			300
Spain	10,081	1,081	1,031
Sweden	340	340	340
Switzerland	30	30	30
U.K.	1,165	2,075	2,270
Total	†15,676	†17,631	16,516
ASIA/PACIFIC			
Australia	265	265	321
China (Taiwan)	690	690	690
India	215.3	254.3	239.3
Japan	6,092	6,123	5,777
Korea	155	155	505
Total	7,417.3	7,487.3	7,632.3
OTHER			
Algeria	120	120	120
Iran	26	26	26
Israel	24	24	24
Qatar	280	280	280
South Africa	150	150	150
Turkey	55	55	55
Total	655	655	655
World total	†44,957.81	†48,773.76	47,828.3

*As of July 1
†Revised

LPG surplus/deficit regions

2



three generations of change, according to Warren Huang, president of International Operations Analysis Corp. (Taipei, Taiwan, ROC).

In the 1940-60 period, the first generation, design was dominated by an approach that used applied chemistry and mechanical engineering. Rule of thumb or nomographs were used for design calculations. The design engineer with 10 or so years experience played a major role in design supervision and management. University training emphasized experimentation.

In the second generation (1960-74), the computer replaced most tedious hand calculation for determination of:

- Overall material balances
- Vapor liquid equilibrium flash
- Fluid flow in piping
- Heat exchanger design (some supported by HTRI)
- Some physical properties.

However, process engineering fundamentals like thermodynamics, reactor design, and catalyst theory, and unit operations principles were not mature enough to provide confident design. Huge safety factors were used, some with 50% overdesign. Others averaged 20-30%.

This overdesign often led to inefficient operations and a waste of energy when pumps and boilers operated at less than 50% capacity. It also causes operating problems in such areas as slurry transport or two phase (liquid/vapor) line operation.

Inaccurate thermodynamic correlation methods produced higher reboiler temperatures and higher reflux. This created higher product loss or wasted energy.

In this period a big gap existed between university and industry research. Most corporate R&D went from pure research to applied research with emphasis on improvement of existing process units.

However, process designers benefitted from both sides. Academic research provided better equations of state, vapor liquid equilibrium, and physical and thermodynamic property correlation methods. Improved catalyst selectivity, increased reactor yield, and modification of reactor design came from industry.

The third generation (1975-79) was a transition period. Designers switched more to computer aided process design. The university followed the industrial research trend and shifted to more applied research.

The impact of the energy crisis on process design was widespread. Process improvements stemming from corporate research led the engineering designer to more efficient process plant design, i.e., better utilization of feedstock and energy.

Design of the future. Integral, flexible, efficient process systems will be the key to the designs of the 1980s. Up to date research results will be used through joint corporate/academic consulting staff type research, with research results shared by the joint venture partners through databank, computer network systems.

Maximum use will be made of results obtained from improvement of existing processing units (Table 4) to avoid duplication of errors in expansions or new plant design. This operating experience feedback will not only improve design accuracy but correct inaccurate thermodynamic and physical data correlations. This will reduce the safety factors and cut inefficiency due to the waste of product and energy.

Maximum heat integration and waste

Table 3

Installed ethylene (olefins) capacity

Company	Location	Ethylene capacity 1,000 metric tons/year	Feedstock*	Coproducts	Capacity 1,000 metric tons/year†
UNITED STATES					
Allied Corp. (with Borg Warner & BASF-Wyandotte)	Geismar, La.	325	E.P.	Propylene	21
				Butadiene	16
				Aromatics	17
Amoco Chemicals Corp.	Chocolate Bayou, Tex.	967	NGL	Propylen	387
				Butadiene	91
				Py gas	332
				Aromatics	84
				Fuels	51
Arco Chemical Co.	Channelview, Tex.	1,180	N,G	Propylen	726
				Butadiene	211
				Aromatics	430
Chemplex Co.	Clinton, Iowa	334	E.P.	Propylene	20.5
Cities Service Co.	Lake Charles, La.	400	NGL	Propylene	250
Conoco Chemicals	Westlake, La.	302	E	Propylene	7.7
				Butadiene	14.5
				Py gas	5.3
				Aromatics	7.6
	Chocolate Bayou, Tex.	682	N,G.	Propylene	500
				Butadiene	61
				Py gas	175
				Aromatics	522
				Fuel oils	414
Corpus Christi Petrochemical Co.	Corpus Christi, Tex.	546	N,G	Propylene	254.5
				C_4	181.8
				Benzene	195.5
Cosen Oil & Chem	Groves, Tex.	9	R	Propylene	30
Dow Chemical	Freeport	1,000	NGL	Propylene	250
				Butadiene	39
	Plaquemine, La.	1,000	NGL	Propylene	—
Du Pont	Orange, Tex.	375	E,P	Propylene	—
				C_4	—
Eastman	Longview, Tex.	442	E,P	Propylene	213
				Aromatics	49
El Paso Products Co.	Odessa, Tex.	236	E,P	Propylene	84
				Butadiene	5
				Aromatics	6
Exxon Chemical U.S.A	Baton Rouge, La.	590	E,P,N,G	Propylene	400
				Butadiene	—
				Aromatics	—
	Baytown, Tex.	590	E,P,N.G.	Propylene	408
				Butadeine	113
B.F. Goodrich	Calvert City, Ky.	136	E,P	Propylene	90
Gulf Oil Chemical Co.	Port Arthur, Tex.	567	E,P,N	Propylene	204
				Butadiene	40.5
				Fuel oils	157
	Cedar Bayou, Tex.	730	E,P,N,G	Propylene	355
				Butadiene	190
				Py gas	273
				Aromatics	46
Mobil Chemical Co.	Beaumont, Tex.	410	LPG,N	Propylene	110
				Butadiene	35
Northern Petrochemical	Morris, Ill.	455	NGL	Propylene	75
				C_4	30
				Aromatics	38
Olin Corp.	Brandenberg, Ky.	50	E,LPG	—	—
Phillips Petroleum	Sweeney, Tex.	970	NGL	Propylene	239
Shell Chemical	Deer Park, Tex.	1,270	NGL,R	Propylene	793.8
				Butadiene	226.8
	Norco, La.	1,315	NGL,R	Propylene	589.7
				Butadiene	226.8
Sun-Olin	Claymont, Del.	109		R	
Texaco	Port Arthur, Tex.	450	N	Propylene	225
	Port Neches, Tex.	225	NGL,R	Propylene	66
				Butadiene	270
Union Carbide	Seadrift, Tex.	562	LPG	Propylene	—
				Butadiene	—
				Aromatics	—
	Taft, La.	500	LPG,N	Propylene	200
				Butadiene	—
				Aromatics	—
	Texas City, Tex.	702	LPG,N	Propylene	140
				Butadiene	—
				Aromatics	—

(Continued)

heat recovery should be made among process units:

- Recovery of reaction or combustion waste heat for electricity and steam generation.
- Use of heat pump or vapor recompression to cut the cooling water needs.
- Use of waste water or low pressure steam.

Integration between process plants or in joint ventures with a utility will use the waste heat or surplus steam of one to save fuel and utilities for the other.

New separation techniques and the high cost of feedstock will put pressure on operators to maximize feedstock use and product recovery by cutting losses to tail gas or in the recycle stream and to maximize by-product utilization. For example, the latest methyl tertiary butyl ether process (MTBE) development uses the C_4 cut from a naphtha cracker formerly used for fuel gas or recycle.

Feedstock use will be maximized by:

- Improved catalyst selectivity
- Improved reactor design; the new generation of naphtha crackers is able to crack a wide boiling range feedstock.

Optimal process flexibility. The energy crisis has forced petrochemical producers to operate in a constantly changing raw materials and energy price environment. Operating policy must be flexible enough to reflect the ratio of raw material cost to product market price to provide the highest profit at all times.

Advancements in computer and instrument hardware technology have paralleled soaring raw material and energy costs. Most designers will consider implementing either overall plant optimal computer control, or microprocessor unit operation control.

Sales, production, inventory, transportation, and operation can be linked through integrated management information and decision systems. They offer better planning in determining raw material and product inventory, storage capacity, and production scheduling.

Light feedstock cracking revival expected.

UNTIL THE EARLY 1970s, the bulk of the U.S. ethylene production was based on natural gas liquid (NGL) feedstocks, mainly ethane and propane. Most NGL crackers were designed in the late 1960s under conditions of an abundant, cheap gas supply.

Since the oil crisis of 1973, almost all incremental U.S. ethylene capacity has been designed for naphtha and gas oil feed. However, crude oil prices have increased faster than the average gas price. NGL cracking has become more profitable, leading to increased interest.

Currently, naphtha/gas oil crackers are operating as much as possible on

Installed ethylene (olefins) capacity—continued

Company	Location	Ethylene capacity 1,000 metric tons/year	Feedstock*	Coproducts	Capacity 1,000 metric tons/year†
U.S.I.	Tuscola, Ill.	180	E		
USS Chemicals	Houston, Tex.	227	NGL	Propylene	54.4
				Butadiene	22.7
U.S. Total		**17,836**			
ALGERIA					
Sonatrach	Skikda	120	LH		
ARGENTINA					
Duperial S.A.I.C.	San Lorenzo	15	N	Propylene	
				Butadiene	6
				Py gas	6
				Fuel oils	5.5
Ipako	Ensenada	15	R		
PASA Petroquima Arg.	Pto. Gral. San Martin	23	P		
Petroquimica Bahia Blanca	Bahia Blanca	200	E,P	Propylene	20
				C_4	14.4
				Py gas	8.7
Argentina Total		**253**			
AUSTRALIA					
Atono Petrochem. Co. Ltd.	Altona, Victoria	156	E,G	Propylene	50
				Butadiene	17
ICI Australia	Botany, NSW	150	N	Propylene	45
				Butadiene	10
				Py gas	55
				Fuel oils	10
Shell Chemical	Clyde, NSW	15	R		
Australia Total		**321**			
AUSTRIA					
OMV A.G.	Schwechat	265	N,G,B	Propylene	140
				Py gas	
BELGIUM					
Petrochem S.A.	Antwerp	520	N	Propylene	230
				Butadiene	140
				Aromatics	204.5
BOLIVIA					
Yacimientos Petroliferos Fiscales Bolivianos	La Paz	230	E,P	Propylene	56
				Py gas	22
BRAZIL					
Brasiliera de Est[illegible]	Sao Paulo	4	EtOH		
Industrias Quimicas Electro Cloro	Sao Paulo	10	EtOH		
Copene Petroquimica	Camarcari-Bahia	388	G,N	Propylene	200
				Butadiene	52.5
				Py gas	102.8
				Aromatics	177.1
				Fuel oils	181.3
Copesul	Triunto RGS	420	N	Propylene	227
				Butadiene	66
				Py gas	192
				Aromatics	176
Petroquimica Uniao S.A.	Capuava-Santo Andre	360	N	Propylene	204
				Py gas	96
				Butadiene	50
Salgema Indusrias Quimicas S.A.	Maceio-Alagoas	60	EtOH		
Brazil Total		**1,242**			
CANADA					
Alberta Gas Ethylene	Joffre, Atla.	544	E	C_3 mix	15
				C_4 cut	20
				Py gas	12
Dow Chemical	Sarnia, Ont.	50	P,B,R		
Imperial (Esso Chemical)	Sarnia, Ont.	450	N		
Petromont	Varennes, Que	225	N	Propylene	—
	Montreal East, Que,	68	P,R	Propylene	60
				Butadiene	2.3
				Py gas	1.9
				Aromatics	6.4
Petrosar Ltd.	Corunna (Sarnias) Ont.	454	N,G	Propylene	329
				Butadiene	91
				Aromatics	127
Canada Total		**1,791**			
CHILE					
Empresa Nacional Del Petr.	Concepcion	60	N		
CHINA					
Chinese Petroleum Corp.	Kaohsiung	634	N	Propylene	288.9
				Butadiene	80
				Py gas	
China Pet. Dev. Corp.	Toufen	56	E		
China Total		**800**			

(Continued)

Installed ethylene (olefins) capacity—continued

Company	Location	Ethylene capacity 1,000 metric tons/year	Feedstock*	Coproducts	Capacity 1,000 metric tons/year†
COLUMBIA					
Empresa Colombiana de Petroleos	Barrancabermeja	115	E,R	OPG	28.6
				Py gas	4.6
Poliolefinas Colombianas, S.A. Policolsa S.A.	Barrancabermeja	100	E,R	Py gas	2.5
Colombia Total		**215**			
FINLAND					
Neste Oy	Provoo	165	N	Py gas	180
FRANCE					
ATO Chimie & Chio Chimie	Gonfreville	320	N	—	—
	Feyzin I	280	N	—	—
	Feyzin II	280	M	—	—
	Laeq	110	NGL	Propylene	185
BP Chimie	Lavera-Martigues	310	NGL,N	Propylene	185
				C_4	50
Cdf Chimie	Carling St. Avold	440	N,G	Propylene	220
				C_4	140
				Py gas	420
				Aromatics	150
				Fuel oils	80
Compenor	Dunkerque	225	N,G,LPG	Propylene	110
				C_4	75
				Py gas	70
				Aromatics	80
				Fuel oils	50
Naphtachimie	Lavera	310	N	Propylene	185
				Butadiene	50
Shell Chimie	Berre	350	N,G,LH	Propylene	190
				Butadiene	75
Esso Chimie	Notre Dame de Gravenchon	300	N,R	Propylene	200
				Butadiene	70
				Py gas	310
France Total		**2,8545**			
GERMANY					
BASF A.G.	Ludwigshafen	450	N	Propylene	164
				C_4	100
				Py gas	264
Caltex Deutschland	Frankfort	250	N	Propylene	120
				C_4	60
				Py gas	210
				Fuels	38
Deutsche Marathon	Burghausen	235	E,P,N	Propylene	117.5
				C_4	72.5
				Benzene	110
Deutsche Texaco A.G.	Heide	80	N	Propylene	55
				C_4	28
Erdolchemie G.m.b.H.	Worringen	740	N	Propylene	520
				Butadiene	245
	Dormagen	360	N	Propylene	250
Esso Chemie G.m.b.H.	Cologne	450	N	Propylene	240
				C_4	38
Rheinische Olefin werke	Wesseling	650	N	Propylene	310
				Butadiene	130
Union Rheinische Braun-Kohlen	Wesseling	440	N,A	Propylene	260
				C_4	
Veba Oel A.G.	Gelsenkirchen	400	N,LPG	Propylene	260
				C_4 cut	165
				Py gas	400
				Aromatics	140
				Fuel oils	60
Chemische Werke Hulsa A.G.	Marl	50	LPG		
Germany Total		**4,105**			
GREECE					
Esso Pappas Chemical A.E.	Thessaloniki	15	R		
INDIA					
Alkali & Chemical Corp.	Rishra, W. Bengal	10	EtOH		
Chemicals & Plastics India	Krishnagiri	12	EtOH		
Hindustan Polymers Ltd.	Visakhapatnam	3.3	EtOH		
Indian Petrochem Corp.	Vadodara	130	N	Propylene	83.3
				Butadiene	22.
				Benzene	23.5
National Organic Chemical Industries Ltd.	Thana, Bombay	60	N	Propylene	35
				Butadiene	7.2
Polychem Ltd.	Bombay	2	EtOH		
Union Carbide India	Bombay	22	N	Propylene	4.5
				Aromatics	4
India Total		**290.3**			

(Continued)

NGL feedstocks—with or without modifications.

Outside the U.S., NGL cracking is rapidly becoming more important. Several large capacity ethane crackers are in operation or under construction in Canada and Mexico. Ethane/propane (E/P) crackers are operating in Norway, Argentina, Qatar, and South Africa. NGL crackers also are under construction in Scotland, Saudi Arabia, and Iraq.

In Europe, consumption of LPG (propane/butane) as a substitute for naphtha could range from 3 to 5 million tons by 1985, according to R.R. Haun, Purvin & Gertz Inc., London. This is based on about 10% of total ethylene production being produced in existing naphtha based olefin plants.

LPG supply/demand. On a worldwide basis, LPG supply is projected to exceed base demand throughout the 1980s (Fig. 1).

LPG supplies will be available from the exporting regions of the Middle East, Africa, Latin America, and Oceania (Fig. 2).

Over the 1980 to 1990 period, LPG supplies available for export from the Middle East are projected to increase from about 10 million tons to about 22 million tons/year. Supplies from Africa could increase from about 300,000 tons to about 10 million tons. Latin American exports are expected to increase from about 500,000 tons to more than 1.5 million tons.

Technical factors. In general, the LPG substitution of naphtha feedstock does not have a significant impact on the material balance. The key area is the yield of methane compared to ethylene, which increases as the LPG substitution increases. This has a direct effect on refrigeration in the demethanizer feed systems and on the demethanizer itself.

Some heat exchange adjustment may be necessary even for small increments of LPG substitution. However, the demethanizer distillation column should be capable of accepting somewhere between a 20% and 30% substitution by either propane or butane before column retraying.

Substitution beyond 30% by either propane or butane is likely to require extensive revamp of the demethanizer system. Also, depending upon the purity of hydrogen which is produced, the hydrogen purification system may have to be modified.

Generally, substitution by butane tends to affect the C_4 handling systems in the recovery section. Substitution by propane has a direct effect on the C_3 systems.

Substitution by propane can cause very early problems in the depropanizer and propylene purification sections. The depropanizer may well have to be retrayed very early in the substitution by

propane.

Butane substitution is a little easier. Very little modification is anticipated even in the butane handling system. Certainly up to 30% butane substitution could be contemplated with only minor plant alterations such as small changes in wheel alignment in compressors, impellers in pumps, and small heat exchange modifications.

When LPG is fed to a furnace, consideration also has to be given to the capability within the furnace to handle such a feedstock. Such capability does not affect the radiant section or even the quench system but rather the convection section where excess waste heat is recovered.

Generally, LPG will require far less feed preheat. It does not need to be vaporized. Accordingly, some modifications may be needed to the convection section to insure the correct distribution of heat duty across the coils.

It may be necessary to consider utilizing excess steam to soak up duty within this section. However, even older furnaces which have little flexibility do not require major modification.

Economic factors. For propane, the feedstock requirements are reduced by some 8%, at a 30% substitution level. The lower feedstock requirement/unit of ethylene production is reflected in lower yields of all by-products with the exception of off-gases.

When a typical mixed butane stream is substituted for naphtha, no major change occurs in the total feedstock requirements. By-product yields of propane, butane/butylenes, and off-gases increase. These increased yields are offset by reduced butadiene and aromatics production.

For plants requiring capital investment, the 1980 breakeven butane/naphtha price ratio was about 0.90 at 30% butanes substitution. If no capital investment was required for butane substitution, the allowable breakeven price ratio would increase to 0.95.

Propane substitution requires an increase in capital investment, attributed primarily to the addition of a propane splitter column required to maintain the purity of the chemical grade propylene product.

For plants requiring capital investment, the average 1980 breakeven propane/naphtha price ratio at 30% substitution was about 0.83.

If no capital investment was required for propane substitution, the allowable breakeven price ratio would increase to 0.93.

Normally, a petrochemical manufacturer will not make a change in feedstock slate if the economics of doing so are only breakeven. Some additional incentive is required.

The additional incentive required to justify the change in plant operation and

Installed ethylene (olefins) capacity—continued

Company	Location	Ethylene capacity 1,000 metric tons/year	Feedstock*	Coproducts	Capacity 1,000 metric tons/year†
IRAN					
Abandan Petrochemical	Abadan	26	R	Propylene	15
ISRAEL					
Israel Petrochemical Enterprises	Haifa	24	N,LPG	—	—
ITALY					
ANIC	Gela	310	E,N	Propylene	160
				Butadiene	40
				Py gas	280
				Aromatics	150
				Fuel oils	55
ICAM	Priolo	550	N,G	Propylene	350
Montedison Group	Brindisi	130	N	Propylene	85
				Butadiene	120
	Ferra	60	—	—	—
	Mantua	60	—	Propylene	40
	Porta Marghera	380	N	Propylene	195
	Priolo	215	N	Propylene	90
				Butadiene	35
Rumianca Sud	Assemini (Cagliari)	75	N	Propylene	45
				C_4	25
				Propylene	121
S.I.R. Consorzio Industriale P.p.A.	Porto Torres	240	N	Butadiene	50
Solvay	Rosignano	50	—	—	—
Italy Total		**2,070**			
JAPAN					
Idemitsu Petrochem. Co., Inc.	Tokuyama	380	N	Propylene	220
				Aromatics	356
Maruzen Petrochem. Co., Inc.	Chiba	505	N	Propylene	319
				Butadiene	75
				Aromatics	325
				Py gas	625
Mitsubishi Chemical Industries	Mizushima	177	N,LPG	Propylene	144
Mitsubishi Petrochem. Co.	Kashima	300	N	Propylene	—
	Yokkaichi	420	N		
Mitsui Petrochemical indus.	Chiba	140	N	Propylene	68
				Py gas	90
				Fuel oils	30
	Iwakuni-Ohtake	180	N	Propylene	116
				Py gas	120
				Fuel oils	50
Mizushima-Ethylene	Mizushima	360	N,LPG	Propylene	216
				Py gas	250
				Fuel oils	50
Nippon Petrochemicals	Kawasaki	190	N		
Osaka Petrochemical Indus.	Takaishi, Osaka	300	N,LPG	Propylene	200
				Py gas	300
				Aromatics	225
				Butadiene	
				Fuel oils	
Sanyo Ethylene Co.	Mizushima	390	N		
Shin Daikyowa Petrochem. Co.	Yokkaichi	320	N,B,P	Propylene	220
				Py gas	300
				Aromatics	169
Showa Denko, K.K.	Oita	540	N,LPG	Propylene	270
				Py gas	220
Sumitomo Chem. Co. Ltd.	Chiba	430	N,B	Propylene	327
	Nihama	139	N	Propylene	123
Tonen Petrochem Co. Ltd.	Kawasaki	556	N,LPG	Propylene	—
				Butadiene	105
Ukishima Petrochem. Co. Ltd.	Kawasaki	450	N	Propylene	225
				Py gas	210
				Fuel oils	110
Japan Total		**5,777**			
KOREA					
Honam Ethylene Co., Ltd.	Yeo-cheon	350	N,LPG,G	Propylene	187
				C_4	129
				Py gas	307
				Aromatics	148
				Fuel oils	98
Korea Oil Corp.	Ulsan	155	N	Propylene	81
				Butadiene	24
				Py gas	127.9
				Aromatics	69.4
Korea Total		**505**			
MEXICO					
Petroleos Mexicanos	Congrejera	500	E		
	Pajaritos	209	E		
	Posa Rica	182	R		
	Ryenosa	27	LH		
	Ciudad Madero	14	R		
	Minatitian	3	R		
Mexico Total		**935**			

(Continued)

Installed ethylene (olefins) capacity—continued

Company	Location	Ethylene capacity 1,000 metric tons/year	Feedstock*	Coproducts	Capacity 1,000 metric tons/year†
NETHERLANDS					
Dow Chemical Europe	Terneuzen	960	N	Propylene	450
				Benzene	600
				Butadiene	150
DSM	Limburg	800	N,G,LPG	Propylene	450
				Benzene	150
				Butadiene	90
Shell Nederland Chemie BV	Moerdijk	500	N,G	Propylene	300
				Butadiene	115
				Py gas	400
				Fuel oils	450
Netherlands Total		**2,260**			
NORWAY					
I/S Noretyl	Rafnes	300	NGL,N	Propylene	70
				Py gas	30
Portugal	Sines	300	N	Propylene	150
PUERTO RICO					
Union Carbide Carbide, Inc.	Ponce	413	N	Propylene	
QATAR					
Qatar Petrochemical	Umm-Said	280	E	Propylene	5
SOUTH AFRICA					
So. Africa Coal, Oil & Gas Co.	Sasolburg	150	Syn. gas§	Propylene	120
				Butadiene	27
				Aromatics	20
SPAIN					
Dow	Tarragona	350	N	Propylene	130
				Butadiene	50
				Py gas	300
				Fuel oils	75
Enpetrol	Puertollano	260	N	Propylene	130
				Butadiene	35
				Py gas	204
				Fuel oils	56
	Tarragona	350	N	Propylene	130
				Butadiene	50
				Py gas	300
				Fuel oils	75
Industrias Quimicas	Tarragona	71	N	Propylene	36
				Butadiene	7.5
				Aromatics	40
Spain total		**1,031**			
SWEDEN					
Esso Chemical A/B	Stenungsund	340	N	Propylene	170
				C_4 cut	100
				Py gas	170
				Fuel oils	70
SWITZERLAND					
Lonza, A.G.	Visp	30	N,LPG	Acetylene	
TURKEY					
Petkim Petrokimya A.S.	Yarimca	55	N	Propylene	39.6
				C_4 cut	25.8
				Py gas	58
				Fuel oils	8.1
UNITED KINGDOM					
BP Chemicals	Battan Bay	340	N	Propylene	200
				Butadiene	60
	Grangemouth	250	N	Propylene	180
				Butadiene	48
BP/ICI	Wilton	650	N	Propylene	300
				Butadiene	80
Esso chemical Ltd.	Fawley	105	N,G	Propylene	100
				Butadiene	80
Imperial Chemical	Wilton	775	N	Propylene	—
				Butadiene	—
Shell Chemicals U.K. Ltd.	Carrington	150	N	Propylene	—
				Butadiene	—
U.K. Total		**2,270**			
VENEZUELA					
Pequiven	El Tablazo	150	E,P		
WORLD TOTAL		**47,828.3**			

*Key: E = ethane P = propane B = butane R = refinery streams N = naphtha G = gas oil LH = light hydrocarbons NGL = natural gas liquids (ethane, propane, butane) LPG = liquefied petroleum gas (propane, butane) EtOH = ethanol

†Coproduct production is only estimated or design quantity. Actual production can vary widely depending on feedstock state, severity, etc.

§From coal gasification.

in product distribution, as a result of a feedstock change, varies for different plants.

In some plants, the prospects of significant downtime for modifications may inhibit the use of LPG. In other plants captive markets for coproducts may prove to be an obstacle.

When LPG is imported from offshore sources, significant terminaling costs also are incurred in the transfer of product from the LPG carrier to land based storage and distribution facilities. If Europe is to effectively compete for its share of LPG as a petrochemical feedstock, new marine terminal and storage facility projects must be implemented.

Ethylene unit revamp cuts energy needs

SUBSTANTIAL SAVINGS IN energy requirements have been achieved by Elf France at a 280,000-ton/year ethylene plant in Feyzin, France. The savings were the result of major modifications carried out by SFT-Lummus (Fig. 3). Annual fuel savings are running between 45,000 and 55,000 tons oil equivalent (900-1,100 b/d).

Two types of modification were made. One was aimed at direct energy savings through reduced fuel consumption. The other targeted indirect energy savings by heat recovery.

For the direct route:

- Heat recovery from flue gases was increased by installation of an additional convection section serving all the cracking furnaces (economizers).
- Low level heat recovery from steam condensate was raised by installation of plate heat exchangers.
- Replacement of live steam injection by closed loop reboilers for stripping services cut steam needs.

Four major modifications were made for the indirect approach:

- Flare gases were sent through a compressor for recovery to the process section and nitrogen used instead of fuel gas to purge the flare stack.
- Overhead ethylene losses from the demethanizer were reduced by replacing existing tray internals with packed beds.
- Installing larger intercoolers reduced the pressure drop in the charge gas compressor section.
- A vaporizer and drier were installed on the feed line to the ethylene fractionation tower.

The major contributions to the overall energy savings at Feyzin plant were made by the economizers, the revamped demethanizer, and the reduced interstage pressure drop on the charge gas compressor. Smaller—yet significant—savings were achieved as a result of the flare gas recovery compres-

Table 4

Savings through process optimization

Energy conservation	Olefins	Ethylbenzene-styrene	Polyester-nylon
Boiler		Cut excess air, save 3% fuel	Cut excess air, save 6% fuel.
Furnace	Waste heat recovery saves 6% fuel.	Waste-heat recovery saves 3% fuel.	Waste-heat recovery saves 9% fuel.
Replace insulation	Save 6% fuel.		Save 10% fuel.
Steam distribution	Steam turbine maintenance	Steam turbine maintenance.	Reuse of MP and LP steam cuts steam needs 10%.
Steam turbine	Cuts steam requirements by 10%	Cuts steam requirements by 15%	
Refrigeration system	Maintenance saves energy by 3%	Maintenance saves 5% energy	Stop leakage, save 3% steam.
Fractionation	Cuts energy by 6%.	Cuts energy by 6%	Cuts energy by 8%.
Cut recycle gas	Cut recycle by 2%, saves compressor hp & downstream fractionator energy by 2%.		
Heat exchange	Remove fouling saves energy by 5%	Remove fouling, save 3% energy.	
Fuel oil additive		Better boiler maintenance.	Better boiler maintenance.
Dryer			Optimum dryer operating policy saves energy by 30%
Reactor	Increases yield cuts distillate energy requirement.	Increased yield by 4%, save downstream energy by 3%	Cut feedstock by 10%, save 20% of stream requirements in distillation.
Feedstock use, product recovery			
Reactor	Increased ethylene yield from 47 to 50% for ethane fed and 26-29% for naphtha feed; optimal acetylene reactor operation cut ethylene loss by 1-2%.	Increase EB yield from 39 to 43% and styrene from 54.5 to 56.5%; reduce feedstock unit consumption	Cut ethylene glycol feed by 10% save 3% EG. Cut reaction temperature by 20° C, and energy needs by 2%; improved product quality; Raw material reduced 1%.
Fractionator:	Cut production loss by 1-2%, cut recycle gas flow, increased production by 2%	Cuts production loss by 2%	
Refrigeration	Cut ethylene loss by 2%		
Total Annual savings U.S. $ Million	**2.4**	**2.5**	**1.0**

Source: Dr. Warren Haung, 2nd Asian Pacific confederation of Chemical Eng., Manila, Feb. 10, 1981.

sor and the plate type heat exchangers on the steam condensate line.

Altogether, the split between direct and indirect savings was about 45/55%.

Better heat exchange. The cracking furnaces account for some 80% of the total energy involved in the plant. The overall thermal efficiency of a cracking heater is defined as the ratio of total heat extracted in the radiation and convection sections to the total heat supplied. The heat extracted is measured by the flue gas temperatures and composition (excess air primarily). The heat supplied (fired heat) is a direct function of the fuel (gas and/or oil) quantity and quality.

At constant heat loss, the lower the flue gas temperature the higher the overall efficiency. The average thermal efficiency of the Feyzin heaters was around 86% at the original 280° C. flue gas outlet temperature.

Flue gases from the 17 cracking heaters and steam superheaters flowed directly through two huge ducts to two stacks by natural draft. After completion of the project, the additional heat available is used to preheat boiler feed water coming from the deaerator in two additional convection sections (economizers), one section per stack. This water is used to raise high pressure steam, superheated in the superheaters.

Gases are now moved by an electric motor driven fan from the ducts through the finned tubes of the economizers, which are located at grade level alongside furnace row, and on through to the base of the stacks. This induced draft fan overcomes the additional pressure drop imposed by the economizer tubes and the ducts, and increases gas velocity for a higher heat-transfer coefficient.

A 130° C. minimum temperature was selected for two reasons: first, to take into account the possible presence of corrosive, sulfur containing compounds in the fuel gas; and secondly, because of the proximity of an urban area to the plant, where environmental regulations forbid lower flue gas temperatures. The dew point of the acid gases which might be present in the flue gases is somewhat below 130° C.

Automatic safety is provided in case of high or low draft in the radiation/covection sections, or in case of high or low temperatures in the flue gas or water sides of the exchangers. The economizers are isolated from their respective stacks by remote control doors. The original natural draft through the stacks can be immediately reinstated automatically or manually.

The economizers operate independently of each other. Fan dampers adjust automatically in response to changes that are related directly to the number of heaters in operation.

Net savings are about 16.5 million kcal/hr, equivlent to 13,150 tons of fuel/year. An additional 24 ton/hr of superheated, high pressure steam is generated within the steam cracker. This reduces the steam imported from boilers outside batter limits.

The plate heat exchangers used at Feyzin are made of thin, corrugated plates of stainless steel, closely assembled in a sandwich pattern between two guide plates. A tight seal is achieved by synthetic gaskets. Countercurrent liquid flows allow temperature approaches of 2° C., thus permitting excellent recovery of low level heat.

The exchanger transfers heat from the steam condensate going to treatment to the treated boiler feedwater sent to the deaerator. The fluids are relatively clean at low (6 bar) pressure.

These exchangers are subject to plugging or gasket deterioration in case of contaminated fluids and they cannot sustain high pressures. However, for a transfer rate of 5.6 million kcal/hr, only 300 sq m of surface are required (2 x 75 plates). Overall dimensions are much smaller than those of conventional shell and tube exchangers, and maintenance is easy.

Indirect recovery. The intercoolers of the charge gas compressor were increasd in tube size to reduce pressure drop and thus save turbine power and

Financing problems were eased somewhat late in 1981, when the U.S. Congress approved a package of waivers to restrictions that had, among other things, precluded North Slope gas producers from participating in the project.

But estimates that gas delivered via Angts would have to fetch a price of $15/Mcf or more at a time of surplus gas in the U.S. made economics appear questionable.

During 1982, project sponsors delayed by 2 years their scheduled completion date, moving it to 1989. And the 10 company group lost one of its members: American Natural Alaskan Co.

Discussions have intensified over possible alternatives to the Angts. A commission set up by former Alaska Gov. Jay Hammond declared that liquefying North Slope gas and selling the LNG to Japan would be superior economically to Angts.

Any project to liquefy North Slope gas probably would involve construction of about 800 miles of pipeline to carry the gas to liquefaction facilities in southern Alaska.

Another alternative that has been discussed involves basing an Alaskan petrochemical industry on North Slope gas.

Angts is far from ruled out, however. At yearend 1982, sponsors authorized a $750,000 outlay for the first increment of a proposed $3 million study of a gas conditioning plant at Prudhoe Bay. The expenditure was necessary to keep the project on schedule for completion in 1989.

Whatever the outcome, it's unlikely North Slope gas will go untapped. Reserves in Prudhoe Bay oil field alone are estimated at 26 trillion cu ft, and resources in the area are estimated at as much as 200 trillion cu ft.

U.S. gas lines. Completion of the 823 mile Northern Border Pipeline Co. leg of Angts and 793 mile Trailblazer Pipeline System in 1982 contributed to the decline in the gas line projections for 1983.

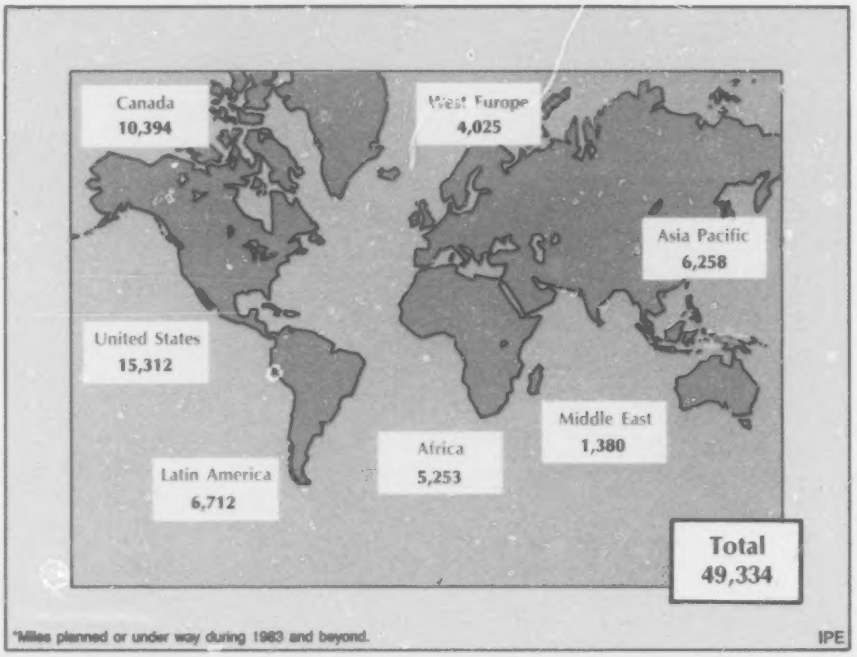
But major projects remain in connection with both systems.

The Rocky Mountain Overthrust Belt, served by the Trailblazer system, remains a focal point for key gas line work.

In the fall of 1982, the Federal Energy Regulatory Commission approved the initial phase of one of the lines, the Trans-Anadarko system. But that phase doesn't include a critical link with the Colorado Interstate Gas Co. system carrying Overthrust Belt gas.

Approved was a 468 mile, 36 in. line designed to carry as much as 430 MMcfd of Anadarko basin gas from Custer County, Okla., to West Monroe, La. An application by Trans-Anadarko sponsors to lay 167 miles of gas line from the Colorado Interstate system at Moore County, Tex., to Custer County hasn't been approved.

Planned non-Communist pipeline construction*



*Miles planned or under way during 1983 and beyond.

IPE

Non-Communist pipeline construction in 1983

Area	4-10 in.	12-20 in.	22-30 in.	Larger than 30 in.	Total
	Miles				
GAS PIPELINES					
U.S.	2,965	1,085	2,610	1,110	7,770
Canada	820	134	188	829	1,971
Latin America	131	764	1,650	268	2,813
Asia-Pacific	242	236	2,563	79	3,120
Western Europe	75	295	1,068	802	2,240
Middle East	68	26	—	205	299
Africa	105	55	—	—	160
Total gas	**4,406**	**2,595**	**8,079**	**3,293**	**18,373**
CRUDE PIPELINES					
U.S.	288	419	—	798	1,505
Canada	—	542	—	—	542
Latin America	224	366	—	—	590
Asia-Pacific	5	—	—	—	5
Western Europe	4	351	—	—	355
Middle East	276	—	307	28	611
Africa	—	—	1,220	—	1,220
Total crude	**797**	**1,678**	**1,527**	**826**	**4,828**
PRODUCT PIPELINES					
U.S.	506	291	623	391	1,811
Canada	94	—	—	—	94
Latin America	435	1,568	—	—	2,003
Asia-Pacific	31	15	—	—	46
Western Europe	—	—	—	—	—
Middle East	—	29	—	—	29
Africa	113	37	317	—	467
Total product	**1,179**	**1,940**	**940**	**391**	**4,450**
NON-COMMUNIST WORLD TOTALS					
Gas	4,406	2,595	8,079	3,293	18,373
Crude	797	1,678	1,527	826	4,828
Product	1,179	1,940	940	391	4,450
Total	**6,383**	**6,213**	**10,546**	**4,510**	**27,651**

A project to carry Overthrust Belt gas to California has been delayed. The Rocky Mountain Pipeline Project, main option of which would involve 583 miles of 36 in. line from Sage, Wyo., to Searchlight, Nev., still is needed, sponsors say.

But markets to be served by the system have no early critical need for new gas supplies, so the sponsors don't envision construction until 1986-87.

Meanwhile, Michigan Wisconsin Pipe Line Co. still plans to lay 634 miles of 20-24 in. gas line from central Wyoming to an interconnection with its southwestern main line at Greensburg, Kan., in what it calls its Pathfinder project.

Sponsors of the Trailblazer line, however, have asked FERC to allow them to carry on behalf of Mich Wis at least some of the Rocky Mountain gas that Pathfinder would handle.

Elsewhere, Pacific Gas Transmission Co. proposed a 431 mile, 42 in. loop of the western Angts leg, subject to deliveries of Alaskan gas through the system. The 360 mile New England States Pipeline Project, which would carry as much as 300 MMcfd of Canadian gas from Calais, Me., to Burrillville, R.I., still is proposed.

And offshore, the Seagull Shoreline System proposal, involving 258 miles of 24 in. line paralleling the Texas coast advanced in 1982 when HNG Offshore Co. became a 25% partner in the initial phase. Other partners are Seagull Pipeline Corp. and Northern Intrastate Pipeline Co.

Construction of the first phase of the line—which when complete will extend from off Cameron County north of Brownsville to a connection with the existing Shipwreck System off Galveston County—is to begin in the second quarter of this year.

U.S. liquid lines. The longest proposed crude oil pipeline in the U.S. continues to fight the permitting battle.

Northern Tier Pipeline Co. in September 1982 proposed changes in its 1,500 mile, 40 and 42 in. pipeline from the West Coast to Minnesota in an attempt to win a critical permit from Washington state.

The pipeline has obtained about 1,400 federal and state permits, but has been blocked by Washington, which is concerned about a proposed tanker terminal at Port Angeles, Wash., and pipeline crossing of Puget Sound.

One option considered by Northern Tier was reduction in pipeline diameter to 36 in., which would cut capacity to 700,000 b/d from 976,000 b/d. The firm also has proposed changes to the tanker terminal and with the state is studying a route around the sound.

In other crude pipeline activity, ownership of the Frontier Pipeline Co. project to carry Overthrust Belt crude and condensate to Casper, Wyo., firmed up in 1982, and completion is scheduled for late 1983.

Subsidiaries of Amoco Pipeline Co., Anschutz Corp., Calnev Pipe Line Co., and Lakehead Pipeline Co. Inc. entered a partnership agreement establishing ownership of the 290 mile, 16 in. line.

And Provident Energy Co. plans to lay 204 miles of 16 in. crude pipeline from Kingman, Ariz., to Mobile, Ariz., with completion scheduled in 1984.

CO_2 pipelines to serve enhanced recovery projects are leading U.S. product pipeline construction and plans.

ARCO Pipeline Co. has nearly completed its 408 mile, 20-24 in. Sheep Mountain CO_2 line from Gardner, Colo., to Seminole, Tex. First deliveries will be used by Amerada Hess Corp. in an enhanced recovery project in Seminole San Andres field.

Cortez Pipeline Co.—owned by Shell Oil Co., Mobil Oil Corp., and Continental Resources Co.—is laying 480 miles of 20-30 in. CO_2 line from fields in Dolores and Montezuma counties, Colo., to Denver City, Tex.

Rocky Mountain CO_2 plans a 550 mile, 30 in. CO_2 line from a proposed gas treatment plant at Big Piney, Wyo., to the Powder River and Williston basins, but a slowdown in action in those areas has delayed action on that project.

Also planned is Amoco Pipeline Co.'s Bravo Pipeline to carry CO_2 from Bravo Dome field near Bueyeros, N.M., to Slaughter and Wasson oil fields in Hockley, Terry, and Yoakum counties, Tex.

Canada, Latin America. Although Canada's projected gas pipeline construction is down, the mileage figures for projects planned or under way remain high.

Still part of the total is the 2,000 miles of 42-56 in. gas line that would be part of Angts and 3,100 miles of 30-42 in. gas line making up the proposed Polar Gas Project, which would carry gas from the Arctic Islands and Mackenzie Delta to southern Canada.

In addition, Q & M Pipelines Ltd. plans to lay 1,900 miles of gas line from Montreal to Quebec City and on to Halifax, N.S.

In other gas pipeline action, East Coast Pipelines Ltd. is studying a 36 in.

Non-Communist pipeline construction in 1983 and beyond*

Area	4-10 in.	12-20 in.	22-30 in.	Larger than 30 in.	Total
			Miles		
GAS PIPELINES					
U.S.	2,965	1,098	3,118	3,057	10,238
Canada	1,173	194	965	5,884	8,216
Latin America	131	2,070	1,650	268	4,119
Asia-Pacific	242	2,162	3,545	258	6,207
Western Europe	92	586	1,609	1,383	3,670
Middle East	68	26	—	410	504
Africa	330	210	—	2,400	2,940
Total gas	**5,001**	**6,346**	**10,887**	**13,660**	**35,894**
CRUDE PIPELINES					
U.S.	288	521	—	1,824	2,633
Canada	100	542	—	1,442	2,084
Latin America	224	366	—	—	590
Asia-Pacific	5	—	—	—	5
Western Europe	4	351	—	—	355
Middle East	276	—	307	28	611
Africa	—	—	1,220	—	1,220
Total crude	**897**	**1,780**	**1,527**	**3,294**	**7,498**
PRODUCT PIPELINES					
U.S.	506	371	1,173	391	2,441
Canada	94	—	—	—	94
Latin America	435	1,568	—	—	2,003
Asia-Pacific	31	15	—	—	46
Western Europe	—	—	—	—	—
Middle East	236	29	—	—	265
Africa	708	68	317	—	1,093
Total product	**2,010**	**2,051**	**1,490**	**391**	**5,942**
NON-COMMUNIST WORLD TOTALS					
Gas	5,001	6,346	10,887	13,660	35,894
Crude	897	1,780	1,527	3,294	7,498
Product	2,010	2,051	1,490	391	5,742
Total	**7,908**	**10,177**	**13,904**	**17,345**	**49,334**

*Projects planned and under way.

line from Sable Island to Nova Scotia and Montreal.

Biggest crude oil pipeline planned in Canada is Esso Resources Canada Ltd.'s 1,400 mile, 42 in. line from Richards Island in the Beaufort Sea to northern Alberta.

Interprovincial Pipeline Ltd., an Esso affiliate, is to begin construction in 1983 on a 560 mile, 12 in. crude and natural gas liquids line from Norman Wells, N.W.T., to Zama Lake, Alta.

Canadian products pipeline activity is sluggish.

Mexico continues to set the pace for Latin American pipeline activity.

The nation completed many projects in 1982 in its attempt to link new producing regions with a growing processing industry. And early in 1982, a Petroleos Mexicanos official told an industry meeting the country plans almost 14,000 miles of pipeline, of which 2,485 miles were to be laid onshore and 620 miles offshore during 1982.

However, economic problems probably will slow Mexican pipeline construction, especially for projects that weren't under way by the start of 1983.

Elsewhere in Latin America, Argentina plans to complete this year its 1,091 mile, 12-30 in. Centro-Oesta gas pipeline from Neuquen to Santa Fe. Bolivia and Brazil are studying a 1,165 mile, 28-30 in. natural gas line between Santa Cruz, Bolivia, to Sao Paulo, Brazil. About 340 miles of the line would be in Bolivia and the rest in Brazil.

Asia/Pacific. In the Asia/Pacific region, the biggest project hasn't progressed from the early planning stage.

It was a proposal by the Dutch gas distribution company N.V. Nederlandse Gasunie to conduct a feasibility study on a 1,900 mile, 20-50 in. grid for Indonesia with links to Singapore.

The feasibility study would take 2 years to complete, and the first of five construction phases would be operational by 1987. The system, tapping gas at Arun field and the Natuna Island area field, would run through Sumatra and Java and extend to Batum Island near Singapore.

In Australia, the Western Australia State Energy Commission is pressing work on its 869 mile, 26 in. gas pipeline from Dampier to Perth with a 53 mile, 20 in. extension to Wagerup.

Under study in Malaysia is a 100 mile, 36 in. gas line from Luconia field off Sarawak to the big gas plant at Bintulu. Also, a 140 mile, 14-30 in. gas gathering and transmission system is under construction from Duyong gas field off Trengganu to Kerteh in Peninsular Malaysia. The country is considering a 270 mile line to carry gas from off the eastern peninsula to the west coast.

In India, a 158 mile, 32 in. gas line is under construction in the Gulf of Cambay. It will carry gas from South Bassein field to Hazira in Gujarat state. Associated onshore pipelines are under study.

Western Europe. Norway, Denmark, and the U.K. have significant pipeline projects in various stages based on North Sea production.

Norway's project is the Statpipe natural gas system. It involves 180 miles of 30 in. line from Statfjord field to Karsto, Norway, 118 miles of 28 in. line from Karsto to a riser platform that also is terminus of 96 miles of 36 in. line from Heimdal field, and 118 miles of 36 in. line from the riser platform to a similar facility near Ekofisk field.

From Ekofisk, dry gas will be carried to Emden, W. Germany, through the Norpipe system.

Denmark's work involves several segments of oil and gas line that will bring production from Danish North Sea production ashore and carry it to several processing centers.

Among the longest segments are 171 miles of 30 in. gas line from Tyra field and Store Baelt-Fyn to Kerkaard-Sjaelland and 138 miles of 20 in. crude line from Gorm field to Kerkaard. Both are under construction with completion scheduled this year. A 140 mile, 30 in. gas line from Egtved to Dragor is to be completed in 1984.

In the U.K., Shell U.K. Exploration & Production Ltd. plans to lay 138 miles of 20 in. gas liquids line from the St. Fergus, Scotland, gas terminal handling North Sea production to a fractionation plant at Mossmorran. And the firm is considering 170 miles of 16 in. gas line from Fulmar field to St. Fergus.

Elsewhere, Italy's Snamprogetti is conducting a feasibility of a 425 mile gas pipeline network involving various pipe diameters in the southern part of the country.

Saipem is laying 160 miles of 48 in. gas pipeline from Melizzano to Civitacastellana and plans to complete next year 100 miles of 42 in. gas line from Civitacastellana to Arezzo and a leg of the same length and diameter from Arezzo to near Bologna.

Middle East, Africa. Pipeline activity is spotty in the Middle East and Africa.

Iran has targeted a 1984 completion for the first and second sections of its IGAT II gas pipeline, involving 368 miles of 56 in. pipeline. But the nation's war with Iraq keeps progress doubtful.

Oman is laying 251 miles of crude pipeline of as much as 8 in. in diameter in the northern part of the country.

North Yemen plans 170 miles of 10 in products line from Salif to Mabar, then north to Sana. And Turkey's Turkiye Petrolleri plans to lay 277 miles of 30 in. crude pipeline in that country.

In Africa, Algeria plans to complete this year 317 miles of 24 in. and 7 miles of 14 in. LPG pipeline from Hassi R'Mel to Arzew. Nearly complete in that country is a 325 mile, 30 in. crude line from Ohanet to Haoud El Hamra.

In South Africa, Sasol plans 150 miles of 8 in. gas pipeline.

Global recession and slumping energy markets may have delayed some pipeline projects and cast doubt on plans for others early in 1983. But the continuing need for new energy supplies and geographical shifts in the international processing industry will keep pipeline construction on the move for years.

U.S. pipelines keep energy moving

IN THE U.S., INTERSTATE pipeline systems continue to expand despite steadily rising construction costs. One example is the Northern Border Pipeline which was recently completed and put on stream to move natural gas from Canada to the Midwest.

Natural gas pipelines hold the construction lead with 71 projects and more than 9,000 miles of pipeline on the boards. In second place is products pipelines with 18 projects planned or under way involving more than 2,900 miles of pipeline. Eight crude oil pipeline projects involve more than 2,000 miles of pipeline.

In addition, four coal slurry pipeline projects are on the boards involving almost 5,500 miles of line.

U.S. interstate pipeline mileage. A tabulation compiled from reports filed with the Federal Energy Regulatory Commission (FERC) by the regulated interstate liquids and gas pipelines for 1981 shows the combined U.S. pipelines mileage of the interstate network stands at 447,449 miles. This figure compares with 446,921 miles of pipeline for 1980. The mileages are not directly

Table 1

U.S. interstate pipeline mileage: 1972-1981

	Miles		
Year	Gas	Liquids	Total
1972	246,551	173,532	420,083
1973	248,773	170,691	419,464
1974	246,872	173,342	420,213
1975	255,792	172,680	428,472
1976	254,548	174,072	428,590
1977	256,198	170,948	427,146
1978	258,576	162,452	421,028
1979	264,134	169,794	433,928
1980	274,248	172,673	446,921
1981	274,634	172,815	447,449

Sources: FERC Form P and Form 2 annual reports filed by interstate pipelines and FERC published reports.

Table 2

Investment in liquids pipelines

Item	Company and investment, $ A	B	C	D	E	Total, $	Percent
CRUDE PIPELINES INVESTMENT BY FIVE COMPANIES							
Land	1,470,556	899,155	294,320	715,796	1,081,983	4,461,810	0.30
Right of way	12,080,048	1,234,768	316,178	15,468,349	14,127,889	43,227,232	2.93
Line pipe	130,369,475	31,093,087	12,834,561	90,854,104	149,490,188	414,641,415	28.07
Line pipe fittings	6,779,544	1,995,559	1,894,224	15,617,268	21,065,020	47,351,615	3.20
Pipeline construction	178,092,375	33,273,941	17,201,476	190,073,731	186,319,758	604,961,281	40.95
Buildings	12,840,519	5,422,807	2,465,082	9,456,052	7,399,315	37,583,775	2.54
Pumping equipment	17,425,532	6,686,245	2,582,712	15,876,283	44,838,425	87,409,197	5.92
Machine Tools and machinery	....	....	....	33,140	1,170	34,310	....
Other station equipment	62,924,454	17,342,738	4,052,944	27,124,277	18,641,335	130,085,748	8.80
Oil Tanks	13,388,040	8,550,530	5,678,530	16,175,808	23,507,389	67,300,297	4.55
Delivery facilities	....	1,805,853	5,234,589	2,383,963	5,945,545	15,369,950	1.04
Communication systems	....	2,253,268	4,709	8,724,718	1,930,930	12,913,625	0.87
Office furniture & equipment	246,989	174,225	142,033	407,882	566,408	1,537,537	0.10
Vehicles & other work equip.	4,350,275	1,514,781	375,610	4,312,925	179,642	10,733,233	0.73
Other property	....	....	....	....	50,223	50,223	....
Total	**439,967,807**	**112,246,957**	**53,076,968**	**397,224,296**	**475,145,220**	**1,477,661,248**	**100.00**
PRODUCT PIPELINES INVESTMENT BY FIVE COMPANIES							
Land	4,336,063	1,759,007	356,322	852,997	2,515,737	9,818,126	0.37
Right of way	27,801,535	10,793,055	15,109,485	8,105,212	6,422,128	68,231,415	2.59
Line pipe	335,642,139	67,481,346	99,874,886	85,034,771	102,284,185	692,317,327	26.28
Line pipe fittings	69,652,727	12,345,921	12,281,321	1,560,280	14,107,340	109,947,597	4.17
Pipeline construction	545,559,804	107,9[illegible]7,214	173,273,689	91,942,786	135,108,823	1,053,792,316	39.98
Buildings	21,695,023	3,742,615	3,451,686	9,698,522	14,713,545	53,301,391	2.02
Pumping equipment	42,636,711	5,738,828	24,664,478	27,451,202	21,258,642	121,749,869	4.62
Machine tools & machinery	....	....	....	....	233,242	233,242	....
Other station equipment	107,949,140	19,787,888	26,342,718	22,480,980	60,083,257	236,643,983	8.98
Oil tanks	47,250,043	16,666,407	4,571,015	16,813,709	33,049,188	118,350,362	4.49
Delivery facilities	....	....	9,465,503	10,567,564	31,002,569	51,035,636	1.94
Communication systems	698,326	270,715	1,728,820	7,436,923	—	10,134,784	0.33
Office furniture & equipment	8,907,167	1,170,412	873,087	436,440	364,014	11,751,120	0.45
Vehicles & other work equip.	3,953,408	1,277,310	4,328,191	1,567,297	895,307	12,021,513	0.46
Other property	69,978,557	....	16,321,039	....	....	86,299,596	3.27
Total	**1,288,060,643**	**248,938,718**	**392,642,248**	**283,948,683**	**422,037,977**	**2,635,628,269**	**100.00**

comparable as the number of companies required to file FERC reports varies slightly each year. The mileage for 1981 represents 132 liquids pipeline companies and 104 natural gas companies. Table 1 lists the total miles of interstate liquids and gas transmission pipelines from 1972 through 1981.

A tabulation of the mileage reported by the liquids pipeline companies for 1981 breaks down into 38,558 miles of gathering lines, 57,904 miles of crude oil trunk lines, and 76,353 miles of products trunk lines for a slight increase of 202 miles reported compared with 1980.

Reports filed by the interstate gas transmission pipelines for 1981 list a total of 196,942 miles of transmission pipelines, 72,812 miles of field pipelines, and 4,610 miles of storage pipelines, a net increase of 386 miles compared to the total from 1980 reports.

Energy delivered. The reports filed with FERC by the interstate liquids pipeline firms for 1981 show that the 132 companies delivered almost 6.1 billion bbl of crude oil and more than 4.1 billion bbl of refined products, for a total of more than 10.2 billion bbl. The total crude oil trunk line traffic adds up to more than 1,813 billion bbl miles, and the total products pipeline trunk line traffic adds up to more than 1,740 billion bbl miles. The total trunk line traffic of the crude oil and products trunk lines adds up to more than 3,553 billion bbl

Table 3

10-year onshore construction-cost trend

Size	Fiscal year*	Average cost, $/mile R.O.W.	Material	Labor	Misc.	Total	Range, $/mile Low	High
8 in.	1982	3,730	45,219	122,860	14,629	186,438	134,830	201,206
	1981	7,801	46,010	83,581	14,498	151,890	(†)	(†)
	1980	6,614	59,068	52,243	17,432	135,358	55,625	193,000
	1979	1,189	40,692	63,518	14,951	123,350	50,374	581,916
	1978	1,590	32,123	30,554	8,660	72,927	61,614	109,956
	1977	1,403	34,423	27,002	8,963	71,791	28,844	126,063
	1976	....	....	....	....	....	....	....
	1975	2,561	11,948	29,915	8,732	53,155	37,898	75,896
	1974	1,504	11,785	19,242	1,599	34,130	(†)	(†)
	1973	1	16,360	13,500	1,240	31,100	(†)	(†)
12 in.	1982	15,794	160,146	174,016	72,294	422,432	233,220	600,610
	1981	3,197	68,361	39,672	19,205	130,435	(†)	(†)
	1980	13,785	70,967	92,268	29,336	221,356	166,582	377,419
	1979	1,590	46,062	47,283	7,121	102,056	96,822	158,185
	1978	6,697	55,362	61,919	13,830	137,808	(†)	(†)
	1977	4,332	34,429	22,658	4,573	65,992	53,839	177,694
	1976	....	....	....	....	....	....	....
	1975	2,135	20,908	24,401	3,396	50,841	44,909	52,249
	1974	2,400	18,570	28,385	2,725	52,080	(†)	(†)
	1973	7,080	17,100	30,000	7,240	61,380	27,230	97,990
16 in.	1982	8,286	128,016	82,504	56,856	276,002	197,384	376,572
	1981	....	....	....	....	....	....	....
	1980	9,446	88,864	46,582	28,274	173,166	147,200	197,895
	1979	....	....	....	....	....	....	....
	1978	7,506	54,936	54,117	12,552	129,111	86,898	203,721
	1977	3,635	50,574	32,260	9,347	95,817	68,897	145,916
	1976	3,248	80,373	26,575	9,419	119,615	(†)	(†)
	1975	1,512	29,290	19,629	4,367	54,798	45,001	121,922
	1974	2,251	22,464	32,020	10,135	66,870	45,040	112,613
	1973	2,040	23,050	16,600	1,700	43,390	37,400	52,100
20 in.	1982	15,244	171,368	149,933	68,173	404,713	313,069	557,655
	1981	10,742	153,689	65,579	12,012	242,022	219,351	402,490
	1980	5,544	145,901	106,355	26,726	284,526	240,776	333,957
	1979	....	....	....	....	....	....	....
	1978	3,235	101,052	83,810	12,346	200,443	153,959	242,685
	1977	5,415	95,045	85,842	16,044	202,346	110,349	312,337
	1976	....	....	....	....	....	....	....
	1975	7,258	53,951	37,251	18,134	116,593	101,674	155,982
	1974	6,356	49,152	98,168	14,712	163,388	118,231	219,835
	1973	3,600	36,100	48,150	4,100	91,950	88,170	100,550
24 in.	1982	12,194	149,075	118,593	72,694	352,556	(†)	(†)
	1981	13,690	165,746	148,577	78,734	406,747	352,089	838,986
	1980	10,052	166,119	122,060	28,046	326,277	196,409	678,322
	1979	5,268	152,878	193,227	19,206	370,579	(†)	(†)
	1978	2,372	112,790	125,435	17,045	257,642	239,480	371,932
	1977	....	....	....	....	....	....	....
	1976	4,784	95,656	94,319	29,755	224,514	(†)	(†)
	1975	4,306	75,126	38,115	18,189	135,736	130,939	139,833
	1974	3,944	53,295	29,764	13,047	100,794	89,495	148,841
	1973	1,450	53,550	37,450	10,050	102,500	(†)	(†)
30 in.	1982	37,210	336,461	242,747	104,168	720,586	476,944	1,363,650
	1981	16,719	314,636	178,733	72,965	583,053	373,900	933,961
	1980	7,224	300,949	130,864	62,858	501,895	393,000	862,685
	1979	25,884	239,454	290,474	35,752	591,560	529,178	604,298
	1978	12,231	187,718	216,264	20,895	437,108	(†)	(†)
	1977	6,485	147,814	91,862	22,469	268,630	266,513	270,684
	1976	22,456	112,497	96,141	19,750	250,844	168,029	471,679
	1975	17,267	92,819	123,824	19,981	261,730	179,445	414,866
	1974	9,766	98,123	64,677	21,706	194,289	120,270	281,075
	1973	11,240	101,380	93,650	19,350	225,600	166,490	522,000

Table 3

10-year onshore construction-cost trend—continued

Size	Fiscal year*	Average cost,$/mile R.O.W.	Material	Labor	Misc.	Total	Range,$/mile Low	High
36 in	1982	21,410	440,211	342,750	75,820	880,190	643,548	1,414,851
	1981	26,376	535,737	452,281	130,503	1,144,937	710,000	1,430,950
	1980	30,928	423,687	298,684	163,546	916,845	687,144	1,221,463
	1979	20,654	272,397	203,639	57,814	554,504	443,024	682,280
	1978	26,441	199,878	150,667	65,439	442,425	(†)	(†)
	1977	20,101	209,878	115,498	18,366	363,843	(†)	(†)
	1976	....	....	....	....	....	....	....
	1975	12,567	118,579	94,095	10,929	236,170	194,960	355,962
	1974	7,350	121,715	79,025	24,551	232,641	204,841	288,668
	1973	9,400	116,400	79,700	9,700	215,250	192,000	245,870

*1972-1978 based on completed costs reported to FERC by fiscal year; 1979 by calendar year. 1980-82 based on FERC Construction Permit Applications, by fiscal year. †One report only.

miles, for an increase of 4.3% over that reported for 1980.

For the same period in 1980, the 125 firms reporting listed crude oil deliveries of 6.4 billion bbl, while total deliveries added up to 10.6 billion bbl. The trunk line traffic for 1980 added up to 1,948 billion bbl miles of crude oil and 1,458 billion bbl miles of products.

Natural gas sales by the 104 gas transmission companies reporting for 1981 is almost 18.5 trillion cu ft, compared to 17.3 trillion cu ft sold by 101 reporting interstate gas transmission companies in 1980, an increase of about 6.7%.

Pipeline investment and revenue. The interstate crude oil and products pipeline companies reported an investment in carrier property of more than $21.2 billion for 1981, compared to an investment in carrier property of more than $19.7 billion for 1980, an increase of 7.6%. The increase in carrier property was $821 million in 1981, compared to $878 million in 1980. Operating revenue for the liquids pipeline firms increased by more than 5% in 1981 compared to 1980, reaching almost $6.7 billion. The operating revenue reported for 1980 was about $6.4 billion.

Net income for 1981 increased 6.2% over 1980 for the liquids pipeline companies, from $1.9 billion in 1980 to $2 billion in 1981. Net income as a percentage of investment in carrier property was 9.6% in 1981 vs. 9.7% in 1980.

The interstate natural gas transmission companies reported an industry gas plant investment total of $39.2 billion at the end of 1981 compared to $34.2 billion at the end of 1980.

Operating revenues increased from $45.3 billion in 1980 to $57.8 billion in 1981 for the gas transmission companies. At the same time, net income reached $3.8 billion in 1981 compared to $3.1 billion in 1980.

As shown in Table 2, the investment in five crude oil pipelines stood at $1.48 billion at the end of 1981, compared to $1.43 billion at the end of 1980, an increase of 3.4%.

The investment in the five products pipeline firms stood at $2.64 billion at the end of 1981, compared to $2.57 billion at the end of 1980, for an increase of 2.6%. The split in investment for the crude oil and the products pipeline companies is reflected in the pie charts. In both cases, the investment in pipeline construction is by far the highest component.

Construction costs. The cost of line pipe and fittings and the cost of getting the pipeline built add up to more than 70% of the cost of a pipeline system. Further, these costs for pipeline components and construction continue to rise each year.

The composite cost index for oil pipelines rose 10.81% in 1981 compared to 1980, standing at 205 vs. 100 for the base year of 1974. The composite cost index for gas pipelines rose 15.38% in 1981 compared to 1980, standing at 180 vs. 100 for the base year of 1977.

In other words, the composite cost index for oil pipelines has more than doubled in 7 years, while the composite cost index for gas pipelines is 1.8 times

Investment split

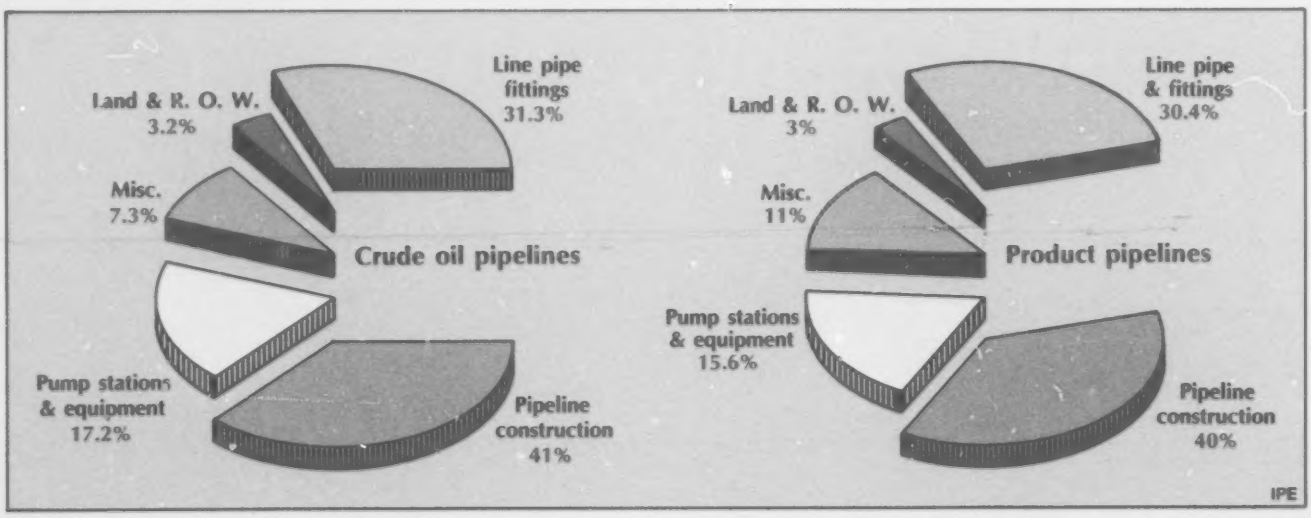


Table 4

Current pipeline costs

Size,in.	Location	Miles	$ Material	Labor	Misc.†	R.O.W. & damages	Total	$/mile
ONSHORE PIPELINES								
4	Ohio	1.70	59,600	148,000	20,900	17,000	245,500	144,412
4	Florida	3.50	86,000	153,000	57,600	10,000	306,600	87,600
4	Michigan/Wisconsin	4.60	129,594	270,626	161,380	98,140	659,740	143,422
6	Florida*	4.40	163,000	335,000	103,790	55,000	656,790	149,270
6	Ohio	10.60	591,800	1,185,400	698,996	85,000	2,561,196	241,662
8	Missouri	2.70	183,000	68,000	114,914	22,000	387,914	143,672
8	Ohio	4.70	213,200	370,500	46,800	3,200	633,700	134,830
8	Virginia	5.90	274,400	662,600	67,000	37,600	1,041,600	176,542
8	W. Virginia	28.20	1,206,000	3,997,600	378,400	92,000	5,674,000	201,206
10	Minnesota	4.30	267,000	325,700	145,220	124,000	861,920	200,447
10	Colorado*	6.00	366,000	143,000	119,230	39,000	667,230	111,205
10	Oklahoma*	9.15	442,000	180,000	352,759	161,000	1,115,759	121,941
10	Louisiana	9.93	1,085,300	1,467,600	519,500	453,600	3,526,000	355,086
10	Wyoming	16.30	1,045,000	603,000	751,494	156,000	2,555,494	156,779
12	Louisiana	0.25	45,000	67,200	26,700	7,900	146,800	587,200
12	Wyoming	1.70	226,900	110,900	48,574	10,100	396,474	233,220
24	Tennessee/Virginia*	2.20	474,700	456,600	273,604	2,600	1,207,504	548,865
12	Tennessee*	2.50	561,000	505,700	323,500	12,800	1,403,000	561,202
12	Louisiana*	4.92	717,100	1,581,232	444,178	212,490	2,955,000	600,610
12	Virginia*	6.80	1,449,300	1,329,800	756,310	6,600	3,542,010	520,884
12	Oklahoma	21.10	2,847,000	2,817,000	980,590	378,000	7,022,590	332,824
16	Wyoming	9.60	1,200,000	750,000	215,000	35,000	2,200,000	234,043
16	Wyoming	11.50	1,310,000	880,000	230,000	35,000	2,455,000	213,478
16	Wyoming	13.10	2,020,000	1,305,000	345,000	50,000	3,720,000	283,969
16	Texas*	20.20	2,383,483	1,584,437	1,064,640	307,820	5,340,380	264,375
16	N. Dakota	35.50	5,702,962	3,996,180	3,410,595	258,560	13,368,297	376,572
16	Oklahoma/Texas	40.50	4,422,840	2,885,740	1,936,790	617,160	9,862,530	243,519
16	N. Dakota	60.60	9,240,706	6,225,200	5,419,722	387,840	21,273,468	351,047
16	Wyoming*	70.00	7,132,200	3,906,900	2,217,793	560,000	13,816,893	197,384
20	Oklahoma*	6.60	1,173,000	683,000	503,000	53,000	2,412,000	365,455
20	Oklahoma*	6.90	1,229,119	773,091	466,570	105,140	2,573,920	373,032
20	Oklahoma*	7.10	1,476,830	900,620	521,010	108,190	3,006,650	423,472
20	Kansas*	9.70	1,518,876	986,144	615,960	147,810	3,268,790	336,988
20	Louisiana*	32.23	5,405,000	5,050,646	1,997,254	1,547,100	14,000,000	434,378
20	New Mexico	35.70	7,614,000	9,299,000	2,591,290	404,000	19,908,290	557,655
20	Oklahoma	41.20	7,185,000	3,942,000	3,015,000	330,000	14,472,000	351,262
20	Texas/Oklahoma	58.90	12,444,000	13,511,000	4,062,400	1,055,000	31,072,400	527,545
20	Wyoming	114.00	15,476,100	11,682,960	7,519,920	1,010,860	35,689,840	313,069
24	Wyoming/Colorado/Kansas	520.00	77,519,220	61,668,800	37,800,860	6,340,000	183,328,880	352,556
30	Oklahoma	12.85	3,831,000	1,934,000	920,497	141,000	6,826,497	531,245
30	Wyoming	19.00	5,461,000	2,244,500	1,082,828	273,600	9,061,928	476,944
30	New Jersey*	21.10	7,446,345	11,250,124	4,015,021	4,567,510	27,279,000	1,292,844
30	Pennsylvania*	29.50	14,000,000	18,293,000	5,294,200	595,000	38,182,200	1,363,650
30	Colorado	110.00	34,013,600	12,995,000	8,734,564	1,584,000	57,327,164	521,156
36	Texas	5.05	3,161,000	2,381,000	1,328,000	275,000	7,145,000	1,414,851
36	Texas*	8.16	3,501,000	1,947,000	803,000	350,000	6,601,000	808,946
36	Minnesota*	12.70	5,160,700	6,045,800	786,800	101,300	12,094,600	952,331
36	Minnesota*	15.70	5,201,200	4,197,100	604,900	100,500	10,103,700	643,548
36	Wisconsin*	17.20	5,855,900	5,344,900	696,400	110,100	12,007,300	698,099
36	Wisconsin*	18.10	6,844,600	5,910,700	960,600	115,500	13,831,400	764,166
36	Texas*	27.50	16,238,000	9,960,000	2,736,665	1,183,000	30,117,665	1,095,188
42	Louisiana*	6.02	3,951,178	2,821,095	1,478,108	264,825	85,515,206	1,414,486
42	Louisiana*	17.46	10,514,568	7,575,858	3,973,477	768,350	22,832,253	1,307,689
42	Louisiana*	23.04	13,448,195	10,005,736	5,158,844	1,013,788	29,626,563	1,285,875
42	New York/Pennsylvania	158.00	142,556,331	89,702,744	75,549,811	3,810,570	312,619,456	1,978,604
*Loop								
OFFSHORE PIPELINES								
6	Louisiana	0.89	245,450	994,190	330,270	1,350	1,571,260	1,765,461
6	Texas	1.40	164,800	1,676,500	620,824	4,000	2,466,124	1,761,517
6	Louisiana	1.87	350,000	3,131,000	361,380	—	3,842,380	2,054,749

Table 4

Current pipeline costs—continued

Size,in.	Location	Miles	$ Material	Labor	Misc.†	R.O.W. & damages	Total	$/mile
6	Texas	2.02	147,350	776,420	128,860	1,000	1,053,630	521,600
6	Louisiana	2.10	268,200	1,265,700	622,100	2,000	2,158,000	1,027,619
6	Louisiana	3.03	257,600	1,615,900	293,736	—	2,167,236	715,292
8	Texas	3.03	677,300	2,036,650	592,930	1,350	3,308,230	1,091,825
8	Texas	5.20	815,000	2,067,000	1,109,000	1,000	3,992,000	767,692
8	Texas	11.40	1,670,000	5,757,000	772,000	1,000	8,200,000	719,298
10	Texas	1.14	914,000	2,933,000	732,330	1,250	4,580,580	4,018,053
10	Louisiana	2.70	392,000	2,092,000	1,063,000	2,000	3,549,000	1,314,444
10	Texas	3.06	625,670	1,986,470	615,710	1,250	3,229,100	1,055,261
10	Louisiana	4.60	1,114,000	4,428,000	670,000	5,000	6,217,000	1,351,522
10	Texas	5.94	530,550	1,595,340	328,380	12,870	2,467,140	415,343
10	Texas	9.39	1,765,140	4,573,020	975,830	2,000	7,315,990	779,374
10	Louisiana	9.50	1,400,000	3,650,000	1,770,000	—	6,820,000	717,895
12	Texas	0.53	717,900	3,347,900	892,450	1,250	4,959,500	9,375,547
12	Louisiana	2.10	500,000	1,700,000	805,900	—	3,005,900	1,431,381
12	Louisiana	2.50	1,023,755	2,718,450	778,310	1,235	4,521,750	1,808,700
12	Louisiana	2.78	1,131,330	3,515,480	944,999	1,250	5,593,059	2,011,892
12	Louisiana	3.50	1,005,000	3,138,000	610,000	1,000	4,754,000	1,358,286
12	Louisiana	5.15	1,496,200	2,736,510	932,090	1,250	5,166,050	1,003,117
12	Louisiana	6.01	1,782,550	3,661,530	1,256,070	1,250	6,701,400	1,115,042
12	Louisiana	13.50	1,871,900	5,729,100	2,493,840	2,000	10,096,840	747,914
12	Louisiana	20.70	3,441,000	7,652,000	1,112,926	—	12,205,926	589,628
16	Texas	0.43	665,350	2,075,470	612,060	1,200	3,354,080	7,800,186
16	Louisiana	4.90	1,477,803	2,915,327	1,228,770	1,000	5,622,900	1,147,531
16	Louisiana	5.60	1,601,000	3,475,000	2,052,000	2,000	7,130,000	1,273,214
20	Texas	1.20	1,147,700	3,780,700	1,118,450	1,250	6,048,100	5,040,083
20	Louisiana	28.28	8,648,160	8,507,560	3,998,100	4,170	21,157,990	748,161
20	Louisiana	47.00	16,856,000	24,205,000	4,120,500	—	45,181,500	961,309
24	Texas	2.82	2,838,080	4,384,000	1,431,530	1,250	8,654,860	3,069,099

Source: FERC Construction Permit applications, 6/81-5/82. *Loop
†Includes engr., supv., inspection, surveying, interest, adm. & overhead, contingnecies, and FERC fees.

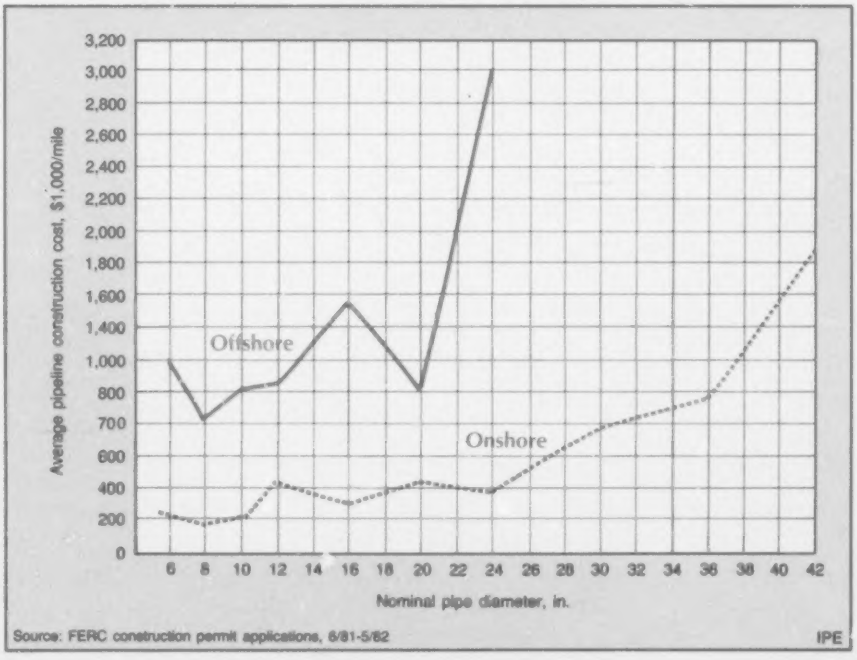
what it was 4 years ago.

Table 3 lists a 10 year onshore construction cost trend for natural gas pipelines, for diameters ranging from 8 in. to 36 in. While the average cost per mile for a given pipe size varies from year to year due to the geographic area, population density, and other factors affecting construction, the table clearly reflects the continual rise in all segments of pipeline construction. For example, the average 8 in. pipeline built in 1973 cost $31,100/mile compared to $151,890 in 1981, and $186,438 through the first half of 1982.

An average onshore 36 in. diameter pipeline constructed in 1973 cost $215,250/mile compared to an average of $1,144,937/mile in 1981.

Table 4 shows a detailed analysis of the cost of 55 onshore gas pipeline projects totaling 1,746 miles of pipeline whose construction permit applications are on file with FERC and whose total cost is estimated to be more than $840 million. The table also includes an analysis of the cost of 32 offshore gas pipeline projects totaling 214 miles whose construction permit applications are on file with FERC and whose total cost is estimated to be more than $217

Average pipeline construction costs



Source: FERC construction permit applications, 6/81-5/82 IPE

Table 5

Current compressor station costs

Location	Horsepower	$ Equipment & material	Labor	Land	Misc.†	Total	$/hp
ONSHORE							
Mississippi	360	334,000	170,000	5,000	188,000	697,000	1,936
Wyoming	1,000	515,000	100,000	27,000	158,000	800,000	800
Tennessee*	1,100	669,000	290,000	—	306,003	1,265,003	1,150
Virginia*	1,100	929,000	470,000	44,000	429,206	1,872,206	1,702
Ohio	1,100	1,004,000	328,000	65,000	518,804	1,915,804	1,742
Virginia	1,100	1,090,000	556,000	82,000	549,006	2,277,006	2,070
Oklahoma*	1,350	1,067,500	477,700	—	404,800	1,950,000	1,444
Texas	1,460	1,400,000	250,000	—	453,000	2,103,000	1,440
Wyoming	1,500	1,423,000	567,400	—	687,462	2,686,862	1,791
Kansas*	2,000	1,120,000	370,000	—	257,450	1,747,450	874
Colorado	2,000	2,250,000	1,033,000	342,000	1,495,630	5,120,630	2,560
Missouri	2,100	2,220,000	300,000	20,000	532,933	3,072,933	1,463
Texas	2,190	1,980,000	450,000	30,000	764,000	3,224,000	1,472
Tennessee*	2,200	1,427,000	622,000	11,000	671,258	2,731,258	1,241
Louisiana	2,218	1,386,600	755,000	25,000	317,820	2,484,420	1,120
Louisiana	2,250	1,962,813	1,029,081	—	604,082	3,595,976	1,598
Oklahoma	2,340	1,910,000	310,000	—	584,330	2,804,330	1,198
Louisiana	2,700	2,240,800	1,091,800	10,000	522,500	3,865,100	1,432
Oklahoma	2,800	2,450,000	335,000	20,000	668,457	3,473,457	1,241
North Dakota	3,000	3,945,000	356,000	50,000	909,000	5,260,000	1,753
Wyoming	3,200	3,090,000	1,304,000	342,000	1,828,740	6,564,740	2,051
New Mexico	3,300	2,301,900	931,900	39,000	398,610	3,678,610	1,115
Wyoming	3,300	3,835,600	3,223,900	—	1,719,462	8,778,962	2,660
Kansas	3,312	3,750,000	1,125,000	15,000	1,758,000	6,648,000	2,007
Oklahoma	3,500	1,404,000	256,000	3,000	201,328	1,864,328	533
Texas	3,830	1,736,000	566,000	45,000	805,400	3,152,400	823
New York*	3,830	3,420,000	2,964,000	—	1,226,000	7,610,000	3,830
Oklahoma*	4,000	2,838,000	1,150,000	—	1,452,650	5,440,650	1,360
Minnesota	7,500	5,370,000	2,740,000	500,000	836,400	9,446,400	1,260
Pennsylvania	19,000	17,340,000	5,458,861	240,161	7,064,267	30,103,289	1,584
New York	38,000	29,555,419	7,872,479	240,161	11,512,739	49,180,798	1,294
*Addition.							
OFFSHORE							
Louisiana	800	581,250	50,000	—	57,774	689,024	861
Texas	922	415,000	215,000	—	96,000	726,000	787
Texas	2,700	2,425,000	1,150,000	—	711,606	4,286,600	1,588

Source: FERC Construction Permit Applications, 6/81—5/82. †Includes engr., supv., inspection, surveying, interest, adm. & overhead, contingencies, and FERC fees.

million.

Generally, the data of Table 4 show that the longer the pipeline, the lower the cost/mile for construction.

Another major cost element in natural gas transmission pipelines is that of compressor stations. Table 5 lists an analysis of 31 onshore compressor station projects and three offshore compressor station projects whose construction permit applications have been filed with FERC.

As with pipeline construction costs, no clear correlation exists between the size of the compressor station and its location. The 31 onshore compressor stations represent a total of 128,640 hp with an estimated total cost of $184 million, for an average cost of $1,434/hp. The three offshore compressor facilities represent a total of 4,422 hp and a total cost of $5.7 million, for an average cost of $1,289/hp.

The cost per horsepower for the 31 onshore compressor stations range from a low of $555/hp for a 3,500 hp station in Oklahoma to a high of $2,560/hp for a 2,000 hp station in Colorado.

The cost per horsepower for the three offshore compressor installations range from a low of $787/hp for a 922 hp installation to a high of $1,588/hp, both off Texas.

need such large volumes of shipping to get the oil to the customers.

BP put 16 of its ships up for sale last October and by the end of 1982 had disposed of all but one of them. Surprisingly in the depressed market it found customers for 11 of the vessels and only four had to go for scrap.

BP executives reckon there is no advantage in owning large tanker fleets when tonnage can be chartered more cheaply on the spot market. Oil companies have been forced to be more flexible in their oil purchasing activities to reduce costs and need the same flexibility in the tanker business, and this can best be obtained in the spot markets.

BP has not been alone in reducing the size of its company owned fleet. Exxon Corp. has disposed of 69 vessels (6.1 million dwt) and the Royal Dutch

Table 1

VLCCs reported sold for scrapping, 1982

Name	Flag	Dwt	Owner	Blt	Sold to	$
Mobil Tern	Li	212,760	Mobil Oil	1970	Taiwan	105
Mobil Raven	Li	231,135	Mobil Oil	1970	Taiwan	105
Shin en Maru	Ja	234,821	NYK	1971	Taiwan	112
Brumaire	Fr	235,616	Cie Nat Nav.	1971	Pakistan	115
World Duchess	Li	222,123	World-Wide	1972	Taiwan	120.50
Jalinga	No	258,820	A. Jahre	1970	Taiwan	126
Phillip of Macedon	Gr	220,050	Nomikos	1970	Taiwan	122.25
World Wonqueror	Li	217,310	World-Wide	1971	Taiwan	123
Energy Creation	Li	223,926	Tung	1972	Korea	112
Andros Orion	Gr	243,664	United Ship.	1970	Taiwan	110
James E O'Brien	Br	217,545	Socal	1970	Taiwan	110
Norse King	No	228,100	Godager	1970	Taiwan	113.50
Afran Comet	Li	231,099	Afran (Gulf)	1973	Taiwan	116
Mobil Condor	Li	230,099	Mobil	1971	Korea	117.50
Esso Bretagne	Fr	251,100	Esso France	1971	Taiwan	117.50
Esso Flandre	Fr	249,564	Esso France	1972	Korea	117.90
Esso Northumbria	Br	250,062	Esso Petr	1970	Taiwan	117.50
Esso Wilhelmshaven	Li	250,000	Esso Tankers	1970	Taiwan	117.50
Esso Copenhagen	Li	249,300	Esso Tankers	1970	Korea	117.50
Regina Maersk	Da	289,064	A.P. Moller	1971	Taiwan	112
Al Saudia	Sa	231,064	Amar Line	1970	Korea	108
Energy Transport	Li	213,724	Tung	1969	Taiwan	107
World Horizon	Li	224,045	Niarchos	1972	Taiwan	112
Myrtea	Fr	212,998	Shell	1970	Korea	107
Sirenia	Pa	228,736	Onstad	1970	Taiwan	107
Tarumi Maru	Ja	257,901	NYK	1972	Taiwan	106
Energy Vitality	Li	212,980	Tung	1971	Korea	103
Esso Caledonia	Br	250,011	Esso Petr.	1971	Korea	108.50
Eugenie	Li	289,649	Livanos	1972	Korea	110
Arietta	Gr	289,623	Livanos	1972	Korea	110
Meta	N.A.	210,223	Shell	1968	Korea	106
Kypros	Gr	217,563	Troodos	1969	Korea	105
Atlantic Progress	Gr	198,047	Livanos	1968	Spain	53.75
World Cavalier	Br	268,337	World-Wide	1974	Korea	105
Esso Nederland	N.A.	253,962	Esso Tank	1970	Taiwan	102.50
Angeliki G	Gr	208,899	Chandris	1969	Taiwan	106.50
Airon	Gr	289,064	Troodos	1971	Korea	102.50
Shinko Maru	Ja	237,570	Sanko	1972	Taiwan	89
Norbay	No	222,375	Sverdrup	1971	Taiwan	103.50
Lancer Lion (ex Jamunda)	Li	267,120	Internat. Shp.	1971	Korea	98.00
Toho Maru	Ja	231,907	Kawasaki	1972	Taiwan	103.00
Ryuko Maru	Ja	232,312	Sanko	1972	Taiwan	106
Meiko Maru	Ja	237,755	Sanko	1972	Taiwan	90
Esso Europoort	N.A.	253,962	Esso Tank	1970	Taiwan	107.50
Tuareg (ex Nerva)	No	222,504	Wilhelmsen	1970	Taiwan	102
E. Hornsby Wasson	Br	221,020	Socal	1970	Taiwan	100.20
Kyokko Maru	Ja	237,201	Sanko	1972	Taiwan	102
Texaco Sweden	Br	255,666	Texaco	1973	Taiwan	95.50
Pegasus	Li	229,288	Shoham Mar	1973	Taiwan	90.16
British Patience	Br	253,838	BP	1974	Korea	91.20
Marinula	N.A.	198,636	Shell	1968	Taiwan	90.50
World Baroness	Li	232,496	World-Wide	1971	Korea	90.75
Esso Europa	Ge	253,951	Esso Tank.	1969	Taiwan	89
Japan Galanthus	Ja	208,900	Japan Line	1970	Korea	87
Kashimasan Maru	Ja	237,651	Mitsui	1973	Korea	85
Yiannis II	Gr	259,471	J. Livanos	1971	Taiwan	85
Thorshammer	No	228,250	T. Dahl	1969	Taiwan	83
Thorshavet	No	227,500	T. Dahl	1970	Taiwan	83
Texaco Panama	Pa	225,967	Texaco	1972	Taiwan	82.50
Texaco Amsterdam	No	229,642	Texaco	1972	Taiwan	82.50
Ekati (ex Venus)	Gr	209,407	Troodos	1969	Pakistan	75

(Total tanker tonnage sold for demolition 1982, 24.5 mill. dwt. - 242 tankers including 61 VLCCs.)

Table 2

VLCCs reported to be converted, 1982

Name	Flag	Dwt	Owner	Blt	Converted to
Phillips Enterprise	Li	229,240	Philtankers	1973	Storage barge
World Saga	Li	228,468	World-Wide	1972	Production ship
Ocean Park	Ko	317,917	Pan Ocean	1974	Storage barge
Korea Donghae	Ko	216,187	Asia Merdi.	1970	Storage barge
Donau Ore O/O	Li	215,500	World-Wide	1971	Ore carrier
Tantalus O/O	Br	214,592	Ocean Trans.	1972	Ore carrier
Atsula Maru O/O	Ja	214,019	Shoyo Kaiun	1973	Ore carrier

(Total conversions 1982, 2.5 mill.dwt.-21 tankers including 7 VLCCs).

Table 3

VLCCs reported lost, 1982

Name	Flag	Dwt	Owner	Blt	Remarks
Hercules	Li	216,641	Maritime Overs.	1971	Sunk

(Total reported lost 1982, 0,6 mill.dwt.-9 tankers including 1 VLCC)
(Total tanker tonnage removed 1982 - 27.6 mill.dwt.-272 tankers including 69 VLCCs)
(Combined carriers are also included in this list.)
Source: Intertanko, Oslo Norway

Shell group has gotten rid of 86 vessels in reducing the capacity of its fleet by 4.2 million dwt since 1975.

Meanwhile, the world's largest tanker, the Cy Tung Group's 564,783 dwt Seawise Giant has been unable to find work since March 1982. The owners stepped up the vessel's size from 420,000 dwt in 1980, but since then it has only carried one full cargo, a half cargo and spent 9 months as a floating storage unit in the Caribbean.

For state companies or other organizations that need to acquire additional tonnage its never been a better time to deal in the second hand market. Not only are prices depressed, but many of the ships on offer are relatively new and in good condition. Pertamina, the Indonesian state oil company, is considering cutting back on plans for five new 85,000 dwt crude carriers and five small gas carriers and buying second hand vessels instead.

The only people to benefit from this downturn in the market are the shipbreaking yards of Taiwan and Korea. And so many vessels are coming onto the market that they do not have the capacity to deal with them all. As a result shipbreaking is becoming a growth industry in other developing countries.

Meanwhile, there have been allegations among shipowners that they have been loosing millions of dollars on scrapping deals because shipbreakers in Taiwan have formed a central buying agency.

Earlier this year Lloyds List, the London-based shipping paper, reported that in Italy owners were throught to have been paid about $900,000 under what might be considered market value through dealing with the agency in the sale of two VLCCs.

The 254,000 dwt Primarosa and Ritina built in 1973 and 1974 were sold subject to the usual provisions for $86 per light displacement ton. The paper learned that the vessels were then resold within Taiwan by auction for $99.13 and $99.90 per light replacement ton.

This was the usual practice since the cartel had been established. In the case of these two vessels the profit of $450,000 on each of them goes to the breakers centrai fund.

As well as scrapping tonnage, owners also have continued to push large numbers of vesels into layup hoping that the slump in demand for oil from the OPEC countries (down from over 30 million b/d to under 20 million b/d in 3 years) will not last indefinitely.

At the end of 1982 a record 65 million dwt of tankers were laid up. Figures from the General Council of British Shipping shows that in December 1980 when crude oil supplies were still tight only 7 million dwt of vessels were laid up. By June the following year the tonnage had doubled and by the end of 1981, 24.6 million dwt was laid up.

The position continued to deteriorate during last year with the figure rising to 52.8 million dwt in June and 59 million dwt by November.

The glut of crude oil and the decline in demand has hit all sectors of the market and even tankers owned by oil producing countries are now being forced into layup. The Arab Maritime Petroleum Transport Company (AMPTC), which is sponsored by the Organization of Arab Petroleum Exporting Countries (Oapec) has been forced to layup five VLCCs at Jebel Ali in Dubai for at least a year in an attempt to cut the company's operating losses during a period of financial difficulty.

AMPTC estimates that it lost $11.6 million on the vessels during 1981 and had a deficit of $8 million in 1982 before it started the layup program at the end of the year.

A further five vessels in the fleet are all chartered. It is thought the company is considering scrapping or selling a number of the vessels and is looking for loans from other Oapec sponsored groups to help it through the sticky financial period.

During the era of tight oil supplies following the Iranian revolution in 1978, oil exporting countries were able to stipulate that any oil purchased, often at premium prices, had to be carried in flag tankers of that country at rates above the world average.

These transport premiums were as much resented by the oil company buyers as the premiums on the crude oil itself. Now the market is oversupplied with crude, buyers have largely gotten rid of these tanker restrictions and are now moving crude in ships of their own choosing at the most favorable rates available.

Fig. 2 shows there was no relief for tanker owners from the depressed world scale rates that prevailed throughout 1982. But there was one area that tanker owners could make money if they were prepared to take the risk.

Once Iran began to step up its exports of crude oil to finance the war with neighboring Iraq, it had to bring the giant tanker terminal at Kharg Island back into service. Although Iraqi aircraft made several strikes against the terminal facilities shipping visiting the loading

counts for 40-50% of the operating costs and Wingsail estimates that its systems can save up to 20%.

In the London courts the Royal Dutch/Shell group has lost its legal battle over the biggest ever maritime fraud, the sinking of the supertanker Salem.

The 213,000 dwt Salem hit the headlines in 1979. The owners of the vessel Oxford Shipping Inc. chartered the vessel to Pontoil for a voyage from Kuwait to Italy. Pontoil sold the cargo to Shell International Petroleum Co.

But on her voyage around the Cape to Europe it made an unscheduled stop in Durban where it unloaded all but 15,000 tons of its cargo. The oil was bought by the South African Government Strategic Fuel Fund and the vessel continued her voyage up the African coast and was scuttled off the coast of Senegal.

The scuttling was witnessed by another passing tanker and the crime discovered, although those involved in the conspiracy have not been traced.

Shell then claimed $50 million under the "taking at sea" in its Lloyds SG policy. But the underwriters maintained that the policy did not cover a taking by the shipowners.

In the English High Court Shell's claim was upheld but overturned on appeal and then went to the House of Lords where judgement was reserved. Britain's highest court then had to decide whether the precedent created by a judgement on the Mandarin Star case which allowed Shell to win the initial High Court action had been wrongly decided.

After lengthy deliberation it agreed that the Mandarin Star case had been wrongly decided. The House of Lords ruled that the phrase taking at sea had for 300-400 years meant seizure or capture by an enemy or pirates and did not include the risk of a shipowners wrongfully misappropriating a cargo.

Tanker industry sources say that in the current depressed climate for the business the temptation to cut corners particularly on inspection and maintenance is greater than ever.

Intertanko is keen to push the idea of more tanker conversions. It says that conversion can mean anything from simple reclassification for dry bulk cargoes alone, as in the case of some 4 million dwt of combi-carrier in the last 10 years, to a remake that strikes the tanker for good from ships' registers.

To convert combi-carriers only seems to move the problem from one sector to another as the bulk market prospects may be too gloomy as well. But it says there are several examples of "the inherent adaptability" of particularly the large crude carrier. One is the drilling platform made out of a 200 m midships section of a VLCC which Dome Petroleum is using in the Beaufort Sea as the core of an ice-island.

Table 4

Conversions, 1972-82

Converted to:	No. of vessels	Dwt
Pure bulk carriers	42 combi-carriers	4.11 mill.
Storage/production/drillship	29 tankers	2.99 mill.
Sheep/cattle carriers	12 tankers	0.49 mill.
Slop/sludge carriers/tank cleaning stations	7 tankers	0.19 mill.
Cement carriers/storage	6 tankers/combis	0.54 mill.
Dry bulk carriers	6 tankers	0.46 mill.
Offshore workshops/pipelaying vessels	4 tankers	0.15 mill.
Crane/heavy lift vessels	4 tankers	0.33 mill.
Ro-Ro carriers	4 tankers	0.13 mill.
Chemical carriers/factories, gas carriers	3 tankers	0.12 mill.
Wharf extension/embankment	2 tankers	0.08 mill.
Other conversions	26 tankers	0.57 mill.*
Total	145 tankers	10.16 mill.

Source: Intertanko, Oslo, Norway

Table 5

Size of the tanker fleet 5,000-19,999 tons deadweight: Oct 31, 1982

Size range (dwt)	Product tankers No.	Product tankers 000 dwt*	Unspecified No.	Unspecified 000 DWT	Total No.	Total 000 dwt
5- 9,999	260	1,639	36	225	296	1,864
10-14,999	103	1,247	17	198	120	1,445
15-19,999	214	3,765	11	190	225	3,955
Total Fleet	**577**	**6,651**	**64**	**613**	**641**	**7,264**

Table 6

Ownership of the tanker fleet 5,000-19,999 tons deadweight: Oct. 31, 1982

Ownership	No.	000 dwt	%
Governments	325	4,034	55.5
Independent shipowners	261	2,514	34.6
Seven major oil companies	39	518	7.2
Other oil companies	16	198	2.7

Source: Drewry Shipping Consultants, London.

Conversion started in 1973 and up to 1981 132 vessels totaling 8.4 million dwt were converted including 21 vessels above 100,000 dwt. It peaked in 1981 when 3.7 million dwt were reported, 39% of all conversions. (Fig. 1) Last year Intertanko heard of 13 conversions including 6 tankers over 100,000 dwt.

At the beginning of 1983, 171 tankers above 200,000 dwt totaling 46.9 million dwt were laid up and a further number of large tankers were waiting for cargoes and available at any time in the spot market. By and large, the unemployed tanker fleet is under the flags of NATO countries and Liberia and might be sold for scrap if employment cannot be found.

Intertanko says it first suggested the idea of storing oil in tankers in the mid-1970s.

In the later part of the decade interest in the idea gradually increased and in October 1981 some 36 million dwt was employed in storage. This included more than 30 VLCCs chartered by the Japanese Ministry of Trade and Industry as part of a program launched in 1978 with 20 big tankers and which reached a peak of 35 VLCCs.

The Japanese storage fleet is now being reduced as permanent onshore facilities become available. American companies have also used floating storage and, according to Howard Houlder (Chartering) Ltd. of London at the beginning of November 1982, 61 vessels of 12.9 million dwt were being used as storage around the world.

The geographical breakdown of this fleet was:

Japan 7,396,565 dwt (29 vessels)
South East Asia 1,996,568 dwt (12 vessels)
Arabian Gulf 1,273,800 dwt (4 vessels)
U.S. Gulf/Caribs. 984,754 dwt (5 vessels)
West Africa 954,626 dwt (7 vessels)
Alaska 130,334 dwt (1 vessel)
Brazil 90,134 dwt (2 vessels)
Med./Atlantics Isles. 83,748 dwt (1 vessel)

Intertanko has not given up the idea of interesting the United States in using floating tankers as part of its strategic storage program.

It claims there are advantages on both economic and environmental and safety grounds.

It says that past experiences and recent discussions have shown that in an emergency, complex problems of timing, priorities and physical distribution are bound to arise.

The time element is a particularly key factor.

Storage of crude in floating tankers as an integrated part of the overall SPR contingency planning would increase substantially the flexibility of the whole program in several areas.

Large tankers make it possible to improve and simplify the coordination and execution of such essential elements as:

- Timing of oil purchases (price, quantity/quality, political and geographical location of supplier.);
- Logistics (deep sea, and domestic transportation);
- Interim storage while awaiting permanent storage facilities to become available;
- Transshipment to regional crude oil terminals, floating or land banks, based in regional requirements and refinery capacity available;
- Existing bi- or multilateral agreements with foreign countries such as, Canada and Mexico for geographical, commercial and political reasons, NATO for strategic reasons, and International Energy Agency for political and commercial reasons);
- The need generally for quick actions or vital changes in previous plans and requirements.

Intertanko has laid out its case for the economic advantage of floating storage in table form below.

The independent tanker owners say there is another economic advantage in using tankers above 250,000 dwt for transporting crude from Arabian Gulf and then storing it until needed. This provides a flexible alternative to temporary leasing land storage which has to be fillled from the incoming tanker. And when the permanent facilities are ready it has to be moved again.

There were two ways of using tankers for U.S. storage. They could be anchored far off the coast in the gulf or the Caribbean or moored to the shore or anchored in or in sheltered areas close to shore which might need special safety precautions.

American oil companies have been using the deep sea storage for about 5 years. At the beginning of 1983 there were eight tankers of 2 million dwt employed in this way but at the peak in November 1981 there were 43 tankers of 13.3 million dwt used for oil storage.

But it adds that tanker storage needs supervision to keep down costs. Tankers can be moored pairs, providing steam, electricity and hydraulic power for the others.

Intertanko has also surveyed the conversion of tankers to offshore production/storage operations. There are about 30 ship-based systems in Mexico, Brazil, the Mediterranean, the Arabian Gulf, South East Asia and the United States.

Twenty-five tankers totaling 2.1 million dwt have been converted for this purpose since 1973 and the rest are custom-built vessels.

One of the first of these systems was the conversion of the 50,000 dwt Esso Newcastle to an offshore storage and treatment vessel renamed the Exxon Santa Ynez.

It was used for processing crude from the Hondo field.

Four more recent developments have shown the potential of large tankers in offshore production systems.

Dome Petroleum of Canada bought the 232,000 dwt World Saga for layup in the Far East and spent over $10 million in Japan cutting off the bow and stern to make the remaining part of the hull a suitable base for an ice island in the Beaufort Sea.

Dome chose a VLCC because only this type of vessel has sufficiently large beam.

Once the bow and stern had been removed it was converted into a caisson and strengthened with concrete to resist ice.

The caisson was installed in 98 ft of water in the Uviluk site in the Beaufort Sea last winter and is reported to have operated successfully. The 525 ft long caisson which is 164 ft wide and 82 ft high is equipped with drilling and accomodation facilities and can be moved from site to site.

The drilling derrick is positioned at one end of the caisson but facilities have been installed at the other end so that a transportable drilling rig could be flown in by helicopter to sink a relief well in the event of a blowout.

The second project involved the 130,000 dwt tanker Al Wasel which has converted at C.N.C. France into a floating storage unit which would act as an integral part of the Dubai Petroleum Co.'s Fateh offshore field development in the Arabian Gulf.

The superstructure was removed and the hull cut into two sections. The afterpart including the engine room was scrapped and the remaining section was made water tight by adding a new 160 ton transverse bulkhead in one piece.

New fairleads and securing points for the anchoring system replaced old equipment.

A helideck and control center for the storage unit were installed on the deck.

The cargo piping, such as cargo cross-over loading lines were partly removed and the pump room rebuilt and automated to allow the pumping of water ballast.

A new loading/unloading cargo network was installed and new systems for power, compressed air and safety were linked to the control center.

A remote control and monitoring console for the operation is also located in the center.

CNC also converted the 210,000 dwt Shell tanker Medora into a floating storage unit for the Shell/Esso Fulmar field in the British North Sea.

The conversion also took place in 1980, and it was the first time that the British authorities had approved floating storage for difficult North Sea conditions.

Previous applications to use tanker storage as part of North Sea developments had been refused.

Standards and regulations for North Sea operations are stringent. The forepeak and the deep tank were repositioned after the reinforcement of the ship's forward structure where the hinge of the single anchor leg mooring (SALM) was inserted.

This served as a mooring device and as a means of conveying the crude into the ship.

LEASING COST PER DAY	VESSEL DWT	OIL CAPACITY MILLION BARRELS	TOTAL COST PER YEAR	COST PER BARREL PER YER	COST PER TON PER YEAR
$9,000	250,000	1.825	$3.28 Mil	$1.80	$13.14
	300,000	2.190		$1.50	$10.95
	350,000	2.555		$1.28	$9.34
$10,000	250,000	1.825	$3.65 Mil	$2.00	$14.60
	300,000	2.190		$1.67	$12.19
	350,000	2.555		$1.43	$10.44
$12,000	250,000	1.825	$4.38 Mil	$2.40	$17.52
	300,000	2.190		$2.00	$14.60
	350,000	2.555		$1.72	$12.56

Table 7

Single point mooring around the world

Country	Year	Port/Field	Owner	Designer/ Contractor	Max. Vessel Size (Dwt)	Hose number-Size/System	Water Depth (Ft.)
Angola	1968	Cabinda	Gulf	SBM	100,000	2-16"/CALM	77
	1979	Quinfuquena	Petrangol	EMH	150,000	2-16"	NA
	1980	Essungo	Texaco/Petrangol	IMODCO	250,000	2-24" & 1-16"/CALM	115
	1980	Cabinda	Gulf	SBM	55,000	1-4"/CALM	118
	1982	Takula	Gulf	SBM	300,000	1-12"/CALM	200
Argentina	1970	Puerto Rosales	YPF	IMODCO	40,000	1-16" & 1-12"/CALM	59
	1975	Caleta Olivia	YPF	IMODCO	60,000	1-20" & 1-12"/CALM	113
	1979	Caleta Cordova	YPF	IMODOC	60,000	1-20" & 1-12"/CALM	89
	1980	Puerto Rosales	YPF	IMODCO	60,000	1-20" & 1-12"/CALM	NA
Australia	1970	Botany Bay	Maritime Services	SBM	120,000	3-12"/CALM	63
Bangladesh	1967	Chittagong	Chittagong Port Trust	IMODCO	45,000	1-12"/CALM	45
Brazil	1968	Tramandai	Petrobras	SBM	105,000	2-16"/CALM	71
	1970	Tramandai	Petrobras	SBM	200,000	1-24"/CALM	71
	1975	Garoupa	Petrobras	CB & 1	53,000	NA	NA
	1975	Garoupa	Petrobras	CB & 1	53,000	NA	NA
	1976	Sao Francisco	Petrobras	IMODCO	200,000	2-20"/CALM	72
	1978	Garoupa	Petrobras	IMODCO	53,000	2-16"/CALM	410
	1978	Enchova 4	Petrobras	SBM	53,000	1-8"/CALM	410
	1979	Tedut & Tefran	CEC/Petrobras	SBM	200,000	2-20"/CALM	72
	1980	Arembepe	Tibras	SBM	4,000	1-16"/CALM	60
	1981	Pampo	Petrobras	SBM	53,000	1-16"/CALM	460
	1981	RJS 28A	Petrobras	SBM	53,000	1-16"/CALM	395
	1981	Badejo	Petrobras	IMODCO	53,000	2-10"/CALM	338
	1982	Corvina	Petrobras	SBM	53,000	2-8"/CALM	492
Brunei	1971	Seria	Shell	SBM	150,000	2-16"/CALM	73
	1975	Seria	Shell	SBM	210,000	2-20"/CALM	67
	1981	Seria	Shell	Mitsubishi	313,000	1-20" & 1-16"/CALM	NA
Cameroon	1976	Kole	Elf Serepca	IMODCO	150,000	1-12"/CALM	80
	1979	Kole	Elf Serepca	Bluewater	250,000	1-24"/CALM	102
	1979	Limboth Point	Sonara	SBM	150,000	2-16" & 1-16"/CALM	75
	1981	Kole	Elf Serepca	IMODCO	250,000	2-24" & 1-16"/CALM	85
Canada	1969	St. John, N.B.	Irving Oil	SBM	350,000	1-24" & 1-16"/CALM	149
Chile	1971	Quintero Bay	Enap	SBM	209,000	2-20"/CALM	154
Congo	1972	Djeno	Elf Congo	SBM	250,000	2-20"/CALM	75
Denmark	1971	Dan	Danbor	SBM	70,000	1-12"/CALM	150
	1979	Gorm	Danbor	SBM	70,000	2-12"/CALM	128
	1982	NA	DDCS	SOFEC	35,000	2-20"/CALM	50
Dominican Republic	1971	Santo Domingo	Refineria Domincia	SBM	150,000	2-16"/CALM	85
Ecuador	1971	Esmeraldas	Gulf/Texaco	SBM	100,000	2-20"/CALM	124
	1971	Esmeraldas	Gulf/Texaco	SBM	100,000	1-24" & 1-20"/CALM	124
	1978	Esmeraldas	Texaco	IMODCO	100,000	1-24" & 1-20"/CALM	118
Equatorial	1963	Bata	CEPSA	IMODCO	20,000	1-16"/CALM	39
Egypt	1968	Ras-el-Shaqiq	Wepco	SBM	100,000	2-16"/CALM	78
	1974	Suez	Sumed	SBM	120,000	2-20"/CALM	82
	1974	Alexandria	Sumed	SBM	120,000	2-20" & 1-16"/CALM	85
	1974	Alexandria	Sumed	SBM	120,000	2-20" & 1-16"/CALM	82
	1974	Alexandria	Sumed	SBM	120,000	2-20" & 1-16"/CALM	82
	1976	Suez	Sumed	IMODCO	250,000	2-24"/CALM	80
	1976	Alexandria	Sumed	IMODCO	250,000	2-24" & 1-20"/CALM	108
	1976	Alexandria	Sumed	IMODCO	250,000	2-24" & 1-20"/CALM	108
	1976	Agami	EGPA	SBM	100,000	2-16"/CALM	98
	1978	El Alamein	Wepco	SBM	100,000	2-16"/CALM	70
	1980	Ras Budran	Suez Oil Co.	SBM	250,000	1-24" & 1-20"/CALM	115
	1981	Suez	Sumed	SBM	500,000	2-24" & 1-16"/CALM	118
	1982	Sidi Kerir	Sumed	IMODCO	250,000	2-20" & 1-20"/CALM	108

Country	Year	Port/Field	Owner	Designer/ Contractor	Max. Vessel Size (Dwt)	Hose number-Size/System	Water Depth (Ft.)
France	1968	Bay of Biscay	Elf	CFEM	NA	NA	NA
	1973	Frontignan	Mobil	IMODCO	270,000	2-20″/CALM	102
Gabon	1965	Gamba	Shell	SBM	100,000	1-16″/CALM	63
	1967	Lucina	Shell	SBM	165,000	1-16″/CALM	112
	1979	Gamba	Shell	SBM	140,000	1-16″ & 1-10″/CALM	63
	1983	Inguessi	AMOCO	Bluewater	—		
	1980	Mayumba	Elf Gabon	Bluewater	70,000	1-4″/CALM	79
Ghana	1978	Bonsu	Agripetco	SOFEC	64,000	1-10″/SALM	79
India	1975	Bombay High	ONGC	SBM	100,000	1-16″ & 1-8″/CALM	240
	1975	Bombay High	ONGC	SBM	100,000	1-16″/CALM	240
	1977	Gulf of Kutch	IOC	SBM	300,000	2-24″/CALM	115
	1982	Bombay High	ONGC	IMODCO	2,500	SBBM	262
Indonesia	1970	Pang Kalan Susu	Pertamina	IMODCO	100,000	2-12″/CALM	NA
	1971	Balikpappan	Union Oil	SBM	250,000	2-20″ & 1-16″/CALM	102
	1971	Java Sea	ARCO	McDermott	45,000	1-8″	NA
	1971	Java Sea	IIAPCO	IMODCO	55,000	2-12″/CALM	120
	1972	Java Sea	ARCO	IMODCO	133,000	1-12″ & 2-16″/CALM	135
	1972	Java Sea	IIAPCO	IMODCO	133,000	2-12″ & 2-20″/CALM	130
	1973	Djatibarang	Pertamina	IMODCO	150,000	3-20″/CALM	75
	1973	Ardjuna	ARCO	SBM	150,000	3-16″/CALM	138
	1973	Ardjuna	ARCO	SBM	200,000	2-16″/CALM	126
	1974	Bekapai	Total	SBM	100,000	2-8″/CALM	123
	1974	Ardjuna	ARCO	SBM	NA	SBS	140
	1975	Poleng	Cities Service	SBM	55,000	2-8″/SBS	180
	1976	Handil	Total	SBM	125,000	2-20″/CALM	105
	1977	Balongan	Pertamina	SBM	150,000	2-20″ & 1-16″/CALM	74
	1978	Udang	Conoco	SBM	93,000	2-8″/SBS	302
	1980	Cinta	IIAPCO	IMODCO	133,000	2-12″ & 2-20″/CALM	130
	1980	Semarang	Pertamina	SBM	17,000	1-16″/CALM	39
	1981	Krisna	IIAPCO	IMODCO	230,000	2-20″, 2-16″ & 1-6″/CALM	NA
	1981	Ardjuna	ARCO	SBM	56,000	1-6″/CALM	135
	1981	NA	LETJES	SOFEC	10,000	2-8″	60
Iran	1970	Cyrus	Ipac	SBM	140,000	2-16″/CALM	141
	1971	Iman Hasan	SIRIP	IMODCO	250,000	2-16″/CALM	82
Iraq	1981	Arabian Gulf	Brown & Root	IMODCO	270,000	2-24″	NA
	1981	Arabian Gulf	Brown & Root	IMODCO	270,000	2-24″	NA
	1981	Arabian Gulf	Brown & Root	SBM	270,000	2-24″	NA
	1981	Arabian Gulf	Brown & Root	SBM	270,000	2-24″	NA
Italy	1963	Fimicino	PURFINA	IMODCO	50,000	2-12″/CALM	49
	1963	Ravenna	SAROm	IMODCO	50,000	2-12″/CALM	NA
	1964	Fiumicino	PURFINA	Dalmine	100,000	1-16″/RMD	NA
	1970	Porto Torres	Sardoil	SBM	255,000	2-20″/CALM	101
	1072	Ancona	API	Lavore Adriatica Maritime	300,000	NA	NA
	1972	Genoa	Port Authority	CIDONIO	500,000	2-20″ & 2-12″	NA
	1978	Nilde	Agip	SBM	80,000	1-6″/SALS	312
	1981	Raspo Mare	Elf Italiana	EMH	35,000	2-10″	NA
Ivory Coast	1980	Bouet	Societe Invoirienne de Raffinage	IMODCO	250,000	3-24″/CALM	164
	1981	Espoir	Phillips	Bluewater	240,000	1-12″/CALM	279
Japan	1961	Niigata	Shell	Niigata	100,000	1-20″	NA
	1963	Oita	Kyushu Oil	IMODCO	100,000	2-12″/CALM	177
	1965	Yokkaichi	Showa-Yokkaichi	Mitsubishi	100,000	2-16″ & 1-16″/CALM	NA
	1965	Yokkaichi	Showa-Yokkaichi	Mitsubishi	100,00	2-16″ & 1-16″/CALM	NA
	1965	Chiba	Maruzen Oil	IMODCO	100,000	3-12″/CALM	NA
	1967	Koshiba	US Army	IMODCO	100,000	2-12″/CALM	65
	1968	Hakozaki	US Army	IMODCO	100,000	2-16″ & 2-12″/CALM	60
	1968	Kawasaki	Showa-Mitsubishi	Mitsubishi	265,000	2-24″/CALM	NA
	1968	Hakodate	Asia Oil	IMODCO	32,000	1-16″/CALM	49
	1968	Yokkaichi	Daikyo Oil	Mitsubishi	200,000	2-20″/CALM	NA
	1968	Yokkaichi	Daikyo Oil	Mitsubishi	230,000	2-20″/CALM	NA
	1969	Toyama	Japan Sea Oil	IMODCO	150,000	2-16″/CALM	NA
	1969	Yokohama	Ogishima Oil	Mitsubishi	200,000	2-20″/CALM	NA
	1969	Ube	Seibu Oil	Mitsubishi	200,000	2-20″/CALM	NA

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	1970	Atsumi	Chubu Electric	Mitsubishi	200,000	2-20"/CALM	NA
	1970	Himeji	Idemitsui Oil	IMODCO	220,000	2-20"/CALM	NA
	1970	Buckner Bay	Toyo Gasoline	IMODCO	100,000	2-16"/CALM	NA
	1970	Tengan	US Army	IMODCO	50,000	2-12"/CALM	70
	1971	Nakagusuki Bay	Esso	Esso. Van Houten	250,000	2-24"SALM	85
	1973	Ube	Seibu Oil	Mitsubishi	200,000	2-20"/CALM	NA
	1974	Kawasaki	Showa-Mitsubishi	Mitsubishi	300,000	2-20"/CALM	NA
	1975	Yokohama	Oghishima Oil	Mitsubishi	200,000	2-20"/CALM	NA
	1976	Yokkaichi	Showa-Yokkaichi	Mitsubishi	300,000	1-20" & 1-20"/CALM	NA
	1981	Mutsu-Ogawara	JNOC	SOFEC	350,000	2-24"/SALM	145
Kuwait	1967	Ras Al Khafji	Arabian Oil	McDermott	150,000	1-16" & 1-12"	NA
	1972	Ras Al Khafji	Arabian Oil	McDermott	250,000	1-24" & 1-10"	NA
	1977	Mina-Al-Ahmadi	KOC	ETPM	532,000	2-24" & 1-16"/RMD	NA
Libya	1962	Brega	Esso	Esso	100,000	Fixed Tower/ Loading Arm	NA
	1965	Ras-es-Sider	Oasis	SBM	100,000	3-16"/CALM	101
	1968	Zueitina	Occidental	SBM	100,000	1-24"/CALM	100
	1968	Zueitina	Occidental	SBM	150,000	2-24"/CALM	105
	1968	Zueitina	Occidental	SBM	150,000	2-24"/CALM	105
	1969	Brega	Esso	Esso Van Houten	300,000	1-24"/SALM	140
	1969	Ras Lanuf	Mobil	SBM	255,000	2-24"/CALM	96
	1969	Ras-es-Sider	Oasis	SBM	255,000	2-24"/CALM	101
	1974	Azzawiya	NOC	DBV/Woodfield	100,000	2-16"	NA
	1974	Azzawiya	NOC	DBV/Woodfield	30,000	1-8" & 1-10"	NA
	1976	Azzawiya	NOC	SBM	140,000	2-20"/SALM	85
	1976	Azzawiya	NOC	SBM	100,000	2-20"/SALM	98
	1979	Zueitina	Occidental	IMODCO	275,000	2-24"/CALM	99
	1980	Ras-es-Sider	Oasis	SBM	300,000	2-24"/CALM	102
Malaysia	1959	Miri	Shell	SBM	70,000	2-8" & 1-6"/CALM	48
	1959	Miri	Shell	SBM	70,000	2-12" & 1-16"/CALM	48
	1962	Miri	Shell	SBM	70,000	2-8" & 1-6"/CALM	48
	1962	Port Dickson	Shell	SBM	100,000	2-16"/CALM	90
	1963	Miri	Shell	SBM	70,000	2-12" & 1-6"/CALM	53
	1974	Labuan	Shell	SBM	313,000	2-20"/CALM	98
	1974	Tembungo	Exxon	SOFEC	94,000	1-10"/SALM	300
	1974	Pulai	Exxon	SBM	190,000	1-12"/SALM	240
	1977	Pulai	Exxon	SBM	166,000	SALS	216
	1978	Bintulu	Shell	SBM	210,000	2-20"/CALM	67
	1981	Trengganu	Petronas	SOFEC	85,000	2-20"/SALM	60
	1981	Trengganu	EPMI	SBM	250,000	1-24"/SALM	92
	1981	Trengganu	EPMI	SBM	250,000	1-24"/SALM	85
Mexico	1973	Tuxpan	Pemex	IMODCO	60,000	2-16"/CALM	60
	1974	Tuxpan	Pemex	IMODCO	60,000	1-10" & 3-16"/CALM	67
	1976	Salina Cruz	Pemex	IMODCO	60,000	3-16" & 1-12"/CALM	75
	1976	Rosarito Beach	Pemex	IMODCO	60,000	1-20" & 2-16"/CALM	77
	1978	Rabon Grande	Pemex	IMODCO	150,000	1-16" & 2-20"/CALM	90
	1980	Cayo Arcas	Pemex	IMODCO	151,000	2-24" & 1-16"/CALM	144
	1980	Doc Bocas	Pemex	SBM	250,000	2-24" & 1-16"/CALM	93
	1981	Cayo Arcas	Pemex	SBM	250,000	2-20" & 1-16"/CALM	151
	1981	Dos Bocas	Pemex	SBM	250,000	2-24" & 1-16"/CALM	93
	1981	Salina Cruz	Pemex	Mitsubishi	250,000	2-24" & 1-16"/CALM	NA
	1981	Cayo Arcas	Pemex	EMH	285,000	2-20"/RMD	131
	1981	NA	Pemex	SOFEC	2,000	SBBM (21)	150
Morocco	1971	Mohammedia	RAPC	IMODCO	100,000	1-8" 1-20"/CALM	72
New Caledonia	1977	Noumea	Le Nickel	SBM	100,000	1-20"/CALM	62
New Zealand	1971	Waipipi Point	Marcona Corp.	IMODCO	75,000	1-12"/CALM	64
	1972	Taharoa	New Zealand Steel	IMODCO	70,000	2-12"/CALM	77
	1976	Taharoa	New Zealand Steel	SBM	150,000	2-12"/CALM	105
Nigeria	1967	Lagos	Nidogas	IMODCO	2,000	1-3" & 1-4"/CALM	13
	1968	Escravos	Gulf	IMODCO	100,000	2-16"/CALM	70
	1968	Forcados	Shell	SBM	210,000	1-20"/CALM	83
	1968	Forcados	Shell	SBM	210,000	-124"/CALM	83
	1971	Qua Iboe	Mobil	IMODCO	255,000	2-24"/CALM	90
	1971	Forcados	Shell	SBM	313,000	1-24"/CALM	91
	1971	Bonny	Shell	SBM	313,000	1-24"/CALM	91

Country	Year	Port/Field	Owner	Designer/ Contractor	Max. Vessel Size (Dwt)	Hose number-Size/System	Water Depth (Ft.)
	1971	Bonny	Shell	SBM	313,000	1-24"/CALM	91
	1972	Brass River	Agip	IMODCO	200,000	2-20"/CALM	96
	1974	North Apoi	Texaco	SBM	50,000	2-20" & 1-12"/CALM	87
	1974	North Apoi	Texaco	SBM	250,000	2-20"/CALM	93
	1976	Brass River	Agip	IMODCO	250,000	2-20"/CALM	95
	1977	North Apoi	Texaco	SBM	250,000	2-24"/CALM	94
	1977	Escravos	Gulf	SBM	300,000	2-24"/CALM	102
	1979	Qua Iboe	Mobil	IMODCO	300,000	2-24"/CALM	95
Norway	1970	Ekofisk	Phillips	SBM	60,000	1-12"/CALM	232
	1970	Ekofisk	Phillips	SBM	150,000	1-12"/CALM	208
	1976	Statfjord	Mobil	CFEM	125,000	2-20"/AC	NA
	1979	Statfjord B	Mobil	SBM	150,000	1-20"/ALP	480
	1982	Statfjord C	Mobil	SBM	150,000	1-20"/ALP	478
Oman	1963	Mina-al-Fahal	P.D. Oman	SBM	100,000	2-8"/CALM	71
	1966	Mina-al-Fahal	P.D. Oman	SBM	165,000	2-16" & 1-8"/CALM	115
	1965	Mina-al-Fahal	P.D. Oman	SBM	165,000	2-20" & 2-8"/CALM	124
	1973	Mina-al-Fahal	P.D. Oman	SBM	500,000	2-20" & 2-8"/CALM	155
	1979	Mina-al-Fahal	P.D. Oman	SBM	350,000	2-20" & 2-12"/CALM	124
Panama	1981	Chiriqui Grande	Petroterminal de Panama	EMH	150,000	2-20"/CALM	NA
	1981	Chiriqui Grande	Petroterminal de Panama	EMH	150,000	2-20"/CALM	NA
Philippines	1967	Subic Bay	US Navy	IMODCO	108,000	2-16" & 1-10"/CALM	85
	1978	Nido	Cities Service	SBM	70,000	1-12"/CALM	200
	1980	Cadiao	Amoco	SBM	127,000	1-12"/CALM	300
	1980	Bataan	Bataan Refining	SOFEC	300,000	2-24"/SALM	94
	1982	Nido	Cities Service	Bluewater	55,000	2-10"/CALM	219
Qatar	1965	Halul	OGPC	SBM	100,000	2-16"/CALM	97
	1972	Halul	OGPC	McDermott	300,000	2-24"	NA
	1972	Umm Said	OGPC	IMODCO	300,000	1-20" & 1-24"/CALM	66
	1976	Doha	OGPC	SBM	65,000	1-6"/CALM	88
	1979	Halul	OGPC	SBM	540,000	2-20" & 1-10"/CALM	120
Saudi Arabia	1970	Zuluf	Aramco	SBM	250,000	2-24" & 1-16"/CALM	111
	1970	Zuluf	Aramco	SBM	450,000	2-24"/CALM	129
	1974	Ju'aymah	Aramco	McDermott	500,000	2-24" & 1-12"	NA
	1974	Ju'aymah	Aramco	McDermott	500,000	2-24" & 1-12"	NA
	1974	Ju'aymah	Aramco	McDermott	500,000	2-24" & 1-12"	NA
	1975	Ju'aymah	Aramco	SOFEC	750,000	2-24" & 1-12"/CALM	135
	1975	Ju'aymah	Aramco	SOFEC	750,000	2-24" & 1-12"/SALM	117
	1981	Ras Al Khafji	Aramco	Mitsubishi	300,000	1-24" & 1-10"/CALM	NA
Singapore	1971	Singapore Harbor	Esso	IMODCO	252,000	2-24"/CALM	88
	1974	Pulau Bukom	Shell	McDermott	300,000	2-24"	NA
	1980	Singapore Harbor	PSA	IMODCO	300,000	2-24"/CALM	105
South Africa	1969	Durban	Shell	SBM	210,000	2-20"/CALM	150
	1974	Durban	Shell	SBM	210,000	1-20"/CALM	150
South Korea	1963	Ulsan	KOC	IMODCO	75,000	2-12", 1-8" & 1-4"/CALM	65
	1969	Yosu	Honam Oil	IMODCO	100,000	2-16"/CALM	112
	1969	Ulsan	KOC	IMODCO	200,000	2-16" & 1-12"/CALM	88
	1977	Onsan	KIPCO	IMODCO	250,000	2-24"/CALM	90
	1980	Ulsan	KOC	Mitsubishi	325,000	2-24" & 1-16"	NA
Spain	1966	Huelva	Rio Tinto	SBM	100,000	2-16"/CALM	75
	1971	Amposta	Shell	SBM	33,530	2-10"/CALM	209
	1973	Tarragona	Enpetrol	SBM	325,000	2-24" & 1-12"/CALM	135
	1975	Algeciras	Cepsa	DBV/Woodfield	500,000	2-20" & 1-12"	NA
	1976	Castellon	Shell	SBM	55,000	SALS	383
	1979	Badalona	Campsa	SOFEC	50,000	2-12"/SALM	107
Sweden	1959	Dalaro	Swedish Navy	IMODCO	3,000	1-4"/CALM	150
Taiwan	1967	Tai-Chung	US Air Force	IMODCO	50,000	1-12"/CALM	76
	1968	Kaohsiung	CPC	IMODCO	100,000	2-16" & 1-10"/CALM	68
	1968	Tai-Chung	US Air Force	IMODCO	50,000	1-12"/CALM	76
	1971	Kaohsiung	CPC	SBM	250,000	2-20"/CALM	100
	1972	Kaohsiung	CPC	SBM	250,000	2020"/CALM	115

Country	Year	Port/Field	Owner	Designer/ Contractor	Max. Vessel Size (Dwt)	Hose number-Size/System	Water Depth (Ft.)
	1979	Chu-Wei	CPC	IMODCO	250,000	2-20"/CALM	121
	1981	Ta-Lin-Po	CPC	SBM	250,000	2-24" & 1-16"/CALM	130
Tanzania	1971	Dar-Es-Salaam	Tanzanian Harbour Authorities	SBM	100,000	2-20"/CALM	78
Thailand	1979	Gulf of Thailand	Union	Bluewater	70,000	1-8"/CALM Yoke	NA
	1981	Erawan	Union	Bluewater	85,000	1-8"/CALM	219
Trinidad	1971	Galeota Point	Amoco	SBM	250,000	2-20"/CALM	95
	1973	Point-A-Pierre	Texaco	IMODCO	260,000	1-12" & 2-24"/CALM	78
	1976	Galeota Point	Amoco	IMODCO	250,000	2-20"/CALM	95
Tunisia	1972	Ashtart	Aquitaine	SBM	70,000	SBS	220
	1974	Ashtart	Aquitaine	SBM	100,000	1-20"/CALM	220
	1978	Ashtart	Serept	SBM	137,000	1-20" & 1-10"/SBS	220
	1982	Tazerka	Shell/Tunirex	SBM	210,000	SALS	470
United Arab Emirates	1968	Fateh	Conoco	SBM	150,000	2-16"/CALM	103
	1972	Das Island	BP	IMODCO	300,000	2-24" & 1-16"/CALM	94
	1972	Fateh	Dubai Petroleum	McDermott	300,000	2-24"	NA
	1972	Mubarras Island	ADOC	SBM	200,000	1-24"/CALM	58
	1973	Mubarek	Crescent	SBM	350,000	2-20" & 1-16"/CALM	160
	1974	Abu-Al-Burr-Koosh	Total/ABK	SBM	100,000	2-12"/CALM	97
	1977	Das Island	ADMA	IMODCO	400,000	2-24" & 1-16"/CALM	94
	1977	Arzanah	Amerada Hess	SBM	252,000	1-12"/CALM	107
	1979	Fateh	Dupetco	IMODCO	120,000	2-20"/CALM	130
	1980	Zakum	Zadco	IMODCO	350,000	2-20" & 1-20"/CALM	95
	1980	Zakum	Zadco	IMODCO	350,000	2-20" & 1-20"/CALM	95
	1981	Sharjah	Amoco	SBM	300,000	1-20"/CALM	65
	1981	Abu-Al-Koosh	Total	EMH	232,799	1-10"	NA
United Kingdom	1965	Nore Estuary	BP	BP/Harlan Wolff	100,000	NA	NA
	1970	Humber River	Conoco	SBM	210,000	1-24"/CALM	74
	1972	Auk	Shell/Esso	Shell/SBM	42,000	1-10"/ELSBM	280
	1973	Argyll	Hamilton Bros.	SBM	100,000	1-12"/CALM	252
	1974	Montrose	Amoco	SBM	50,000	1/10"/CALM	304
	1974	Montrose	Amoco	SBM	50,000	1-10"/CALM	304
	1975	Brent	Shell/Esso	Shell/HC	90,000	NA	NA
	1975	Anglesey	Shell	SBM	750,000	2-24" & 1-16"/CALM	127
	1975	Scapa Flow	Occidental	Micoperi	250,000	NA	NA
	1975	Scapa Flow	Occidental	Micoperi	250,000	NA	NA
	1975	Bewryl	Mobil	CFEM	NA	NA	NA
	1975	Thistle	BNOC	SBM	80,000	2-16"/SALM	535
	1977	Brent	Shell	SBM	80,000	1-16"/CALM	460
	1978	Buchan	BP	IMODCO	107,000	1-12"/CALM	369
	1979	Fulmar	Shell	Exxon	210,000	2-16"/SALM	270
	1979	Ninian	Chevron	IMODCO	3,500	SBBM	433
	1980	Ninian	Chevron	IMODCO	3,500	SBBM(4)	433
	1982	Maureen	Phillips	EMH	85,000	1-16"/AC	NA
	1980	Humber River	Conoco	SBM	280,000	1-24"/CALM	74
	1981	Beryl A	Mobil	SBM	85,000	1-20"/CALM	395
	1982	Beryl B	Mobil	EMH	80,000	1-16"/ALP	NA
United States	1967	Louisiana	Kerr-McGee	McDermott	8,000	1-4"	NA
	1978	Worldwide (portable)	US Navy	IMODCO	70,000	2-10"/CALM	65-200
	1980	Louisiana	Loop	SOFEC	700,000	2-24"/SALM	110
	1980	Louisiana	Loop	SOFEC	700,000	2-24"/SALM	112
	1980	Louisiana	Loop	SOFEC	700,000	2-24"/SALM	114
	1981	Santa Ynez	Exxon	IMODCO	50,000	1-12", 1-8", 6-1" & 1-6"/SALM	494
Uruguay	1975	Jose Ignacio	Ancap	SBM	150,000	2-24"/CALM	64
Venezuela	1968	Moron	CVP	SBM	100,000	2-16"/CALM	63
West Germany	1962	Cuxhaven	West Germany Navy	IMODCO	2,500	1-4"/CALM	26
Western Sahara	1961	El Aaiun	CEPSA	IMODCO	3,000	1-6"/CALM	28
Zaire	1975	Zaire	Gulf	IMODCO	100,000	2-16"/CALM	71
	1976	Zaire	Gulf	IMODCO	79,200	2016"/CALM	79

*Updated from PennWell Maps, 1983

MAJOR COMPANY REPORTS

Capital and exploration expenditures

(U.S. $ Million)	1974	1975	1976	1977	1978	1979	1980	1981
	Capital and Exploration Expenditures							
Amerada Hess	423	283	291	422	353	659	985	1,261
Ashland	283	216	252	501	317	292	286	296
Atlantic Richfield	1,751	1,751	1,826	1,681	1,358	1,823	3,370	3,559
British Petroleum	946	1,751	2,167	1,765	2,409	2,766	2,416	8,215
C.F.P. (Total Group)*	1,000	826	1,249	899	739	697	1,459	NA
Cities Service	439	439	524	501	637	758	1,087	1,544
Conoco	681	844	797	853	1,113	1,586	1,768	NA
E.N.I.	1,015	1,169	1,481	1,346	1,478	1,922	2,510	NA
Exxon	4,520	3,654	5,100	4,600	5,300	7,400	8,000	11,095
Getty	520	513	618	684	865	1,239	1,345	1,975
Gulf	1,564	1,546	1,742	3,013	2,129	2,513	2,968	4,325
Kerr-McGee	228	235	333	269	270	389	575	606
Marathon	273	273	1,067	557	590	790	947	1,499
Mobil	1,652	1,469	2,485	1,786	2,175	3,812	4,649	4,469
Murphy	215	215	175	263	285	317	382	661
Occidental	267	321	370	390	510	566	1,080	1,342
Pennzoil	236	217	247	264	344	369	524	604
Phillips	587	679	716	1,078	940	1,454	1,666	2,664
Shell Group	2,071	3,113	4,188	5,227	5,252	9,034	1,534	2,046
Std. Calif.	2,271	2,360	1,705	1,429	1,692	2,258	3,599	5,568
Std. Indiana	1,876	2,114	1,774	1,874	2,240	3,028	4,326	5,211
Std. Ohio	700	1,642	1,700	1,087	762	602	1,007	4,501
Sun	537	657	616	667	717	852	3,800	1,519
Tenneco	663	550	620	714	1,008	1,477	1,825	2,359
Texaco	1,674	1,864	1,583	1,564	1,581	1,642	3,077	3,166
Union	686	680	798	813	782	1,088	1,700	1,961

*Converted to U.S dollars using exchange rate in effect December 31, 1979.
Source: Annual reports

Gas production

	1974	1975	1976	1977	1978	1979	1980	1981
	(MMcfd)							
Amerada Hess	707	653	591	625	591	638	638	625
Ashland†	287	311	313	215	233	153	26	28
Atlantic Richfield*	1,976	1,819	1,748	1,642	1,517	1,486	1,388	1,296
British Petroleum*	335	300	350	358	385	332	309	345
C.F.P. (Total Group)*	17	33	51	117	293	470	536	NA
Cities Service	1,149	1,084	1,042	958	945	907	849	877
Conoco	1,617	1,551	1,606	1,579	1,504	1,472	1,364	NA
ENI	1,412	1,255	1,401	1,268	1,330	1,328	1,376	NA
Exxon*	9,842	10,645	10,678	10,488	10,368	10,181	9,400	6,727
Getty	1,190	1,118	993	892	797	883	878	900
Gulf	3,028	2,433	2,035	2,167	2,153	2,176	2,032	1,897
Kerr-McGee*	285	244	247	222	230	244	236	229
Marathon	413	385	440	463	425	447	562	596
Mobil	3,581	3,311	3,146	3,240	3,270	3,649	3,599	2,984
Murphy	NA	90	92	85	110	146	166	141
Occidental	55	49	49	48	57	70	82	109
Pennzoil	748	547	501	509	587	622	621	561
Phillips	1,570	1,455	1,380	1,343	1,549	1,558	1,497	1,388
Shell Group*	6,787	6,621	6,714	6,674	6,439	6,516	5,646	5,628
Std. Calif.	1,883	1,800	1,789	1,778	1,712	1,732	1,739	1,674
Std. Indiana	3,635	3,388	3,272	3,286	3,263	3,328	3,057	3,096
Std. Ohio*	110	90	79	86	83	81	80	84
Sun	1,421	1,392	1,330	1,271	1,178	1,200	1,157	1,149
Tenneco	1,040	1,200	1,149	1,107	1,108	1,157	1,139	1,222
Texaco*	4,343	4,035	3,927	3,883	3,894	3,646	3,103	2,931
Union	1,540	1,442	1,391	1,290	1,255	1,266	1,226	1,206

*Sales. †Year ended Sept. 30.
Source: Annual reports.

Refined product sales

(Thousands b/d)	1974	1975	1976	1977	1978	1979	1980	1981
Amerada Hess	591	523	580	648	642	623	550	515
Ashland	436	441	478	517	509	531	481	420
Atlantic Richfield	802	761	812	829	831	860	788	726
British Petroleum	1,960	1,760	1,920	1,940	2,380	2,620	2,390	2,190
C.F.P. (Total Group)	1,195	1,131	1,186	1,183	1,259	1,292	1,224	NA
Cities Service	265	278	290	298	308	292	276	249
Conoco	611	594	592	601	642	622	546	NA
ENI	779	705	790	751	795	930	892	NA
Exxon	5,505	4,990	5,353	5,266	5,390	5,319	4,936	4,601
Getty	280	280	285	306	303	305	351	334
Gulf	1,673	1,610	1,609	1,669	1,683	1,684	1,346	1,194
Kerr-McGee	217	229	217	220	206	171	158	150
Marathon	349	370	441	567	612	624	523	504
Mobil	2,227	2,211	2,264	2,299	2,374	2,362	2,259	2,138
Murphy	145	138	141	138	142	131	109	118
Pennzoil	46	69	67	62	65	66	56	56
Phillips	601	611	577	532	516	508	509	501
Shell Group	5,052	4,620	4,652	4,691	4,900	4,712	4,301	4,121
Std. Calif.	2,184	2,116	2,339	2,455	2,456	2,479	2,374	2,173
Std. Indiana	1,181	1,166	1,245	1,294	1,371	1,316	1,168	1,014
Std. Ohio	333	351	403	407	427	430	414	378
Sun	658	687	728	678	685	678	618	556
Tenneco	144	157	153	154	152	137	126	142
Texaco	3,446	3,241	3,277	3,227	3,236	3,138	2,824	2,656
Union	456	434	453	439	458	463	422	365

Source: Annual reports.

Net income, gross operating revenue

(U.S. $ million)	1976		1977		1978		1979		1980		1981	
	Net income	Gross op. rev.	Net income	Gross op. rev.	Net income	Gross op. rev.	Net income	Gross op. rev.	Net income	Gross op. rev.	Net income	Gross op. rev.
Amerada Hess	161	3,914	182	4,591	139	4,701	507	6,770	540	7,956	212	9,396
Ashland	141	4,407	164	5,051	148	5,426	176	6,740	197	8,520	90	9,507
Atlantic Richfield	575	8,918	702	11,413	804	12,739	1,166	16,677	1,536	24,156	1,671	28,208
C.F.P. (Total Group)†	51	11,439	63	12,901	109	13,595	1,509	17,765	1,223	24,260	NA	NA
British Petroleum†	750	28,543	795	33,031	987	38,983	3,598	50,407	3,430	60,579	2,047	59,972
Cities Service	217	3,964	210	4,388	118	4,661	348	6,277	478	7,786	286	8,546
Conoco	456	8,352	381	9,052	451	9,872	815	13,083	1,026	18,766	NA	NA
ENI†	(105)	12,591	(389)	14,518	(439)	16,672	52	22,890	51	27,675	NA	NA
Exxon	2,615	52,592	2,443	58,460	2,763	64,886	4,295	84,809	5,660	110,469	5,568	113,197
Getty	266	3,275	321	3,544	330	3,758	604	5,121	872	10,437	857	12,887
Gulf	816	18,117	752	19,595	791	19,892	1,322	23,266	1,307	28,790	1,231	28,252
Kerr-McGee	134	1,955	119	2,165	118	2,072	160	2,683	182	3,478	211	3,826
Marathon	195	3,828	197	4,657	225	4,955	323	7,200	379	8,754	343	9,220
Mobil	942	28,046	1,026	34,443	1,131	36,684	2,007	47,485	2,819	63,652	2,433	68,587
Murphy	49	1,020	47	1,148	47	1,218	104	1,596	151	2,017	163	2,447
Occidental	130	5,609	154	6,080	7	6,316	562	9,638	711	12,476	722	14,708
Pennzoil	112	1,195	100	1,280	128	1,553	239	2,052	309	2,483	221	2,682
Phillips	416	5,698	531	6,284	718	6,998	891	9,503	1,070	13,377	879	15,966
Shell Group	2,683	46,623	3,071	53,438	2,422	53,777	6,804	66,111	NA	NA	942	21,787
Std. Calif.	877	20,563	992	22,238	1,089	24,597	1,785	31,755	2,401	42,900	2,380	45,229
Std. Indiana	891	12,690	1,032	14,263	1,076	16,350	1,507	20,197	1,915	27,831	1,922	29,947
Std. Ohio	136	2,916	181	3,523	450	5,198	1,186	7,916	1,811	11,023	1,947	13,811
Sun	381	5,431	412	6,437	415	7,494	700	10,666	785	13,200	642	15,012
Tenneco	361	6,638	417	7,480	452	8,877	571	11,338	726	13,226	813	15,462
Texaco	810	26,932	890	28,444	853	29,124	1,759	39,096	2,240	52,486	2,310	57,628
Texas Eastern	107	1,547	124	2,016	137	2,028	181	2,944	NA	NA	221	4,526
Union	286	5,781	334	6,099	382	6,490	501	8,082	647	10,437	791	11,104
Union Pacific (Champlin)	188	2,065	222	2,554	264	2,989	382	4,029	NA	NA	160	3,981

*Excludes nonrecurring gains & losses when their effect can be determined.
†Converted to U.S. dollars using exchange rate in effect December 31, 1979.
Source: Annual reports

Net production of crude oil and NGL

(Thousands of b/d)

	1974	1975	1976	1977	1978	1979	1980	1981
Amerada Hess	157	156	169	178	177	191	190	156
Ashland	55	58	65	37	37	25	13	12
Atlantic Richfield	596	594	511	563	643	568	589	573
British Petroleum*	4,440	3,440	3,540	3,390	3,720	3,260	2,386	2,298
C.F.P. (Total Group)*	1,772	1,454	1,510	1,430	1,437	1,409	1,268	NA
Cities Service	243	231	225	214	208	204	187	179
Conoco	460	436	461	464	469	482	458	NA
ENI	337	290	316	309	356	367	333	NA
Exxon	†6,367	4,959	5,325	5,091	4,691	4,444	4,011	3,796
Getty	418	409	398	431	444	425	416	424
Gulf	1,815	2,040	1,801	1,687	1,591	1,733	1,178	1,042
Kerr-McGee	37	35	38	38	35	33	33	29
Marathon	377	265	290	311	299	304	290	235
Mobil	2,357	2,144	2,063	2,278	2,024	2,180	1,984	1,844
Murphy	52	48	46	52	52	52	62	62
Occidental	174	150	173	254	326	351	296	247
Pennzoil	54	45	43	42	45	42	37	37
Phillips	338	365	384	403	444	436	452	409
Shell Group	5,917	4,786	4,732	4,847	4,714	4,555	3,719	3,347
Std. Calif.†	3,815	3,025	3,542	3,403	3,289	3,199	3,009	2,813
Std. Indiana	874	945	932	1,004	1,032	849	836	794
Std. Ohio	52	50	42	183	535	611	716	717
Sun	384	363	294	284	275	237	235	245
Tenneco	79	82	89	93	94	99	95	117
Texaco	4,307	3,591	3,860	3,786	3,410	3,475	‡3,316	3,188
Union	364	357	349	335	312	265	251	236

*Crude only. †Gross.
Source: Annual reports.

Crude runs to stills

(Thousands b/d)	1974	1975	1976	1977	1978	1979	1980	1981
Amerada Hess	530	519	551	596	535	560	481	414
Ashland	330	331	348	358	353	368	363	322
Atlantic Richfield	700	722	723	775	815	823	727	627
British Petroleum	2,100	1,720	1,900	1,860	2,000	2,290	1,917	1,638
C.F.P. (Total Group)	1,141	970	1,028	1,010	1,051	1,079	1,224	NA
Cities Service	232	250	250	252	256	260	238	238
Conoco	501	465	464	457	455	494	402	NA
ENI	701	624	794	736	785	887	849	NA
Exxon	5,183	4,331	4,359	4,348	4,427	4,354	4,150	3,878
Getty	250	256	282	280	281	275	269	266
Gulf	1,951	1,701	1,697	1,766	1,766	1,753	1,384	1,133
Kerr-McGee	129	153	165	165	145	123	113	113
Marathon	320	339	390	537	564	541	471	423
Mobil	2,114	2,060	2,049	2,075	2,064	2,063	1,978	1,773
Murphy	92	91	91	94	106	111	91	100
Pennzoil	48	51	53	56	49	56	53	48
Phillips	374	370	318	297	302	287	262	285
Shell Group	4,873	4,258	4,191	4,286	4,242	4,221	3,768	3,315
Std. Calif.	2,134	2,105	2,257	2,301	2,205	2,234	2,186	1,988
Std. Indiana	1,070	1,104	1,176	1,212	1,286	1,200	1,042	944
Std. Ohio	323	364	405	423	421	429	401	362
Sun	570	596	605	609	622	608	518	459
Tenneco	80	84	85	91	88	92	91	99
Texaco	3,060	2,772	2,860	2,870	2,788	2,857	2,533	2,211
Union	421	439	425	437	419	429	381	372

Source: Annual reports.

WORLDWIDE GAS PROCESSING

Capacities as of January 1, 1982, and average production

State	No. plants	MMcfd: Gas capacity	MMcfd: Gas throughput	Production—1,000 gal/day (Averaged based on the past 12 months): Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other	Total products
Alabama	5	182.0	110.4	....	152.2	....	125.1	....	....	63.1	739.3	1,079.7
Alaska	2	51.5	42.5	....	5.6	....	....	....	56.7	....	....	62.3
Arkansas	3	132.0	60.2	1.4	19.5	4.5	13.8	....	35.0	14.0	6.0	94.2
California	37	1,139.0	460.4	....	256.6	27.0	48.1	17.0	261.1	154.4	....	764.2
Colorado	28	779.6	528.9	1.7	131.5	....	59.7	18.5	958.0	45.0	20.4	1,234.8
Florida	3	920.2	774.2	380.0	320.2	11.7	179.9	....	113.6	98.0	....	1,103.4
Illinois	2	551.5	411.4	494.4	383.3	73.9	36.5	....	2.5	28.9	....	1,019.5
Indiana	1	5.6	0.3	....	0.6	....	....	....	....	1.1	....	1.7
Kansas	23	4,949.5	3,407.7	475.1	870.7	78.9	372.5	....	1,048.6	220.8	4.0	3,070.6
Kentucky	2	896.0	652.1	....	....	....	....	....	....	....	475.5	475.5
Louisiana	101	22,915.7	14,652.1	1,573.3	1,814.3	503.4	631.1	464.2	6,671.6	1,032.6	853.2	13,543.7
Michigan	8	505.0	312.8	....	49.7	0.7	1.7	6.0	965.9	28.5	63.6	1,116.1
Mississippi	8	1,006.5	376.8	....	12.3	....	11.1	2.3	33.2	8.7	....	67.6
Montana	9	58.8	35.5	....	27.8	....	7.9	10.0	50.5	....	0.8	97.0
Nebraska	2	22.5	4.6	....	6.1	....	2.6	2.6	....	2.5	....	13.8
New Mexico	37	3,591.5	2,621.0	123.2	340.7	20.3	106.1	246.9	3,299.5	74.0	193.3	4,404.0
North Dakota	9	289.7	161.0	....	171.7	....	68.9	6.8	98.7	75.5	....	421.6
Oklahoma	98	4,684.5	3,151.1	116.7	563.5	118.9	214.0	737.2	3,596.3	188.7	628.2	6,163.5
Texas	422	26,122.9	14,143.5	2,601.0	4,317.6	520.0	1,870.1	1,956.2	12,186.8	2,531.4	2,030.5	28,013.5
Utah	10	517.5	270.7	....	103.7	....	32.5	....	346.9	28.4	2.0	513.5
West Virginia	4	368.0	262.6	202.0	123.0	21.0	38.0	....	322.0	36.0	....	742.0
Wyoming	41	1,385.2	836.0	....	357.0	4.0	201.1	197.1	160.9	110.6	9.4	1,040.1
Total	**855**	**71,044.7**	**43,275.8**	**5,968.8**	**10,827.6**	**1,384.3**	**4,020.7**	**3,664.8**	**30,287.8**	**4,742.2**	**5,026.2**	**65,042.4**

Country	No. plants	MMcfd: Gas capacity	MMcfd: Gas throughput	Production—1,000 gal/day (Averaged based on the past 12 months): Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other	Total products
Abu Dhabi	1	450.0	270.0	....	302.6	....	213.4	....	....	90.4	....	606.4
Algeria	4	5,335.2	4,268.2	....	....	....	....	632.8	....	....	5,449.2	6,082.0
Argentina	6	847.6	603.4	....	252.4	4.7	180.2	....	....	82.0	....	519.3
Australia	1	870.0	569.0	403.0	513.0	....	317.0	....	....	....	774.0	2,007.0
Austria	2	5.7	4.7	....	....	....	....	....	0.9	....	....	0.9
Bahrain	1	110.0	111.0	....	118.3	....	94.1	....	....	134.6	....	347.0
Bolivia	2	474.0	380.0	....	....	....	....	....	32.6	....	....	32.6
Brazil	3	192.0	179.0	....	....	....	....	116.0	185.0	35.0	....	336.0
Canada												
Alberta	290	16,562.7	11,335.3	3,113.5	1,965.4	224.0	1,007.9	761.7	3,946.1	3,293.1	815.5	15,127.2
British Columbia	7	2,000.4	1,506.8	....	56.8	24.9	59.0	100.8	....	4.3	....	245.8
Northwest Territories	2	192.0	41.5	....	....	....	....	....	....	1.2	....	1.2
Saskatchewan	9	128.5	61.6	63.0	45.6	5.0	16.9	....	0.7	....	33.8	165.0
Chile	2	510.0	420.0	....	200.2	....	128.0	....	....	106.9	....	435.1
China, Taiwan	4	271.0	174.1	110.1	50.3	1.1	31.7	....	29.3	28.9	....	251.4
Dominican Republic	1	....	....	....	....	....	....	....	....	....	294.0	294.0
Ecuador	2	....	....	....	....	....	....	2.4	9.1	....	....	11.5
Egypt	4	553.0	263.5	....	....	....	....	87.6	....	92.5	185.4	365.5
France	1	1,130.0	975.0	....	182.0	....	189.0	....	....	539.0	....	910.0
Germany	5	542.9	451.0	....	....	....	....	....	....	....	....	....
Hungary	10	758.1	391.9	....	157.9	22.0	129.8	....	22.6	192.6	273.3	798.2
Indonesia	3	362.8	221.5	....	475.2	....	425.0	....	....	....	16.8	917.0
Italy	9	2,366.0	1,112.0	....	....	....	....	120.0	....	790.2	....	910.2
Kuwait	1	1,680.0	431.0	....	1,420.0	....	903.0	....	....	643.0	....	2,966.0
Libya	7	1,851.0	1,227.0	....	....	....	....	37.8	5,577.0	....	551.0	6,165.8
Mexico	10	3,457.0	2,463.5	1,262.5	4,980.0	....	....	....	....	....	....	6,242.5
Netherlands	1	330.0	184.0	....	....	....	....	....	....	....	6.0	6.0
New Zealand	1	96.0	58.0	....	14.4	....	0.6	....	....	4.3	....	19.3
Pakistan	5	1,215.0	1,092.1	....	....	....	....	21.3	....	7.8	3.1	32.2
Peru	2	84.0	49.0	....	....	....	1.2	10.7	....	42.8	....	54.7
Qatar	2	580.0	464.0	....	1,240.0	....	800.0	....	....	....	604.0	2,644.0
Saudi Arabia	4	2,800.0	....	....	....	....	....	....	....	....	....	....
United Kingdom	5	2,435.0	1,168.0	....	332.0	....	291.0	....	....	1,748.5	58.8	2,430.3
Venezuela	13	2,494.0	1,739.0	....	205.8	12.6	117.6	357.0	1,525.4	137.8	....	2,356.2
Total	**420**	**58,683.9**	**32,215.1**	**4,952.1**	**12,511.9**	**294.3**	**4,905.4**	**2,248.1**	**11,328.7**	**7,974.9**	**9,064.9**	**55,280.3**

To arrive at more accurate totals, natural-gas throughput and liquids production are estimated at 80% capacity in those cases where only capacities are available. This explains apparent discrepancies in the addition of some columns. The letters NR mean no response. *Indicates cycling operations. The symbol < denotes less than 100 gal/day.

Products listed in the last column are identified by numbers: 1—isopentane, 2—upgraded motor fuel, 3—diesel, 4—kerosine, 5—ethane-propane mix, 6—solvent naphtha, 7—jet fuel, 8—normal pentane, 9—residuum, bottoms, 10—distillate, fuel oil, 11—condensate, 12—gas oil.

The process methods in the third column are identified by the following numbers: 1—absorption, 2—refrigerated absorption, 3—refrigeration, 4—compression, 5—adsorption, 6—cryogenic—Joule-Thomson, 7—cryogenic-expander.

Figures in parenthesis do not represent primary production, and are not added in state totals.

Since this compilation includes cycling plants reprocessing pipeline gas, totals shown here for gas throughput do not relate directly to government data on total gas processed, or sold. Similarly, liquids production figures are based on yearly average and do not necessarily reconcile with government data.